

United States Fire Administration



Technical Report Series

SCRAP AND SHREDDED TIRE FIRES

SPECIAL REPORT



Federal Emergency Management Agency



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Major Fire Investigation Program

The United States Fire Administration develops reports on selected major fires throughout the country. The fires usually involve multiple deaths or a large loss of property. But the primary criterion for deciding to write a report is whether it will result in significant "lessons learned." In some cases these lessons bring to light new knowledge about fire -- the effect of building construction or contents, human behavior in fire, etc. In other cases, the lessons are not new, but are serious enough to highlight once again because of another fire tragedy. In some cases, special reports are developed to discuss events, drills, or new technologies or tactics that are of interest to the fire service.

The reports are sent to fire magazines and are distributed at national and regional fire meetings. The reports are available on request from USFA. Announcements of their availability are published widely in fire journals and newsletters.

This body of work provides detailed information on the nature of the fire problem for policymakers who must decide on allocations of resources between fire and other pressing problems, and within the fire service to improve codes and code enforcement, training, public fire education, building technology, and other related areas.

The Fire Administration, which has no regulatory authority, sends an experienced fire investigator into a community after a major incident only after having conferred with the local fire authorities to insure that USFA's assistance and presence would be supportive and would in no way interfere with any review of the incident they are themselves conducting. The intent is not to arrive during the event or even immediately after, but rather after the dust settles, so that a complete and objective review of all the important aspects of the incident can be made. Local authorities review USFA's report while it is in draft form. The USFA investigator or team is available to local authorities should they wish to request technical assistance for their own investigation.

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SCRAP AND SHREDDED TIRE FIRES

SPECIAL REPORT

December 1998

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OVERVIEW

With the ongoing rise in use of motor vehicles, hundreds of millions of tires are discarded each year in the United States. Many are added to existing tire dumps or landfills, and a significant number are gathered for recycling. Stockpiles of scrap tires, whether in dumps or in recycling facilities, pose serious fire protection challenges to fire departments across the country.

Tires burn with a higher per-pound heat output than most coal¹, and the high heat production of tire rubber makes extinguishment very difficult. Tire fires yield large amounts of oil that are flammable and environmentally contaminating. Tire fires frequently become major hazardous materials incidents affecting entire communities, often requiring neighborhood evacuations and protracted fire operations. These fires threaten pollution of the air, waterways, and water table.

This special report examines seven case studies of tire fires that have been typical of those in the United States. The case studies were selected because they occurred in varied circumstances and locations. However, they reveal a common pattern of challenges in tire fire prevention and extinguishment.

In many jurisdictions, fire codes and safety practices for scrap-tire operations are not adequately enforced. In fact, fire department personnel are often unaware of scrap tire operations in their response areas. Tire dumps and recycling operations are often overstocked and poorly maintained, without adequate separation of tire piles.

Pre-planning for tire fires is relatively uncommon. The lack of pre-planning compromises the efficiency and effectiveness of fire operations. Fire departments often try ineffective water or foam extinguishment strategies or attempt to locate needed excavation equipment after the incident begins. Effective and efficient extinguishment requires heavy equipment such as excavators, bulldozers, and front-end loaders specifically suited for piled tire product operations.

¹ Scrap Tire Management Council

Despite these challenges, the incidence and impact of large tire pile fires can be reduced through strict code enforcement and appropriate fire safety practices. Standards for the storage of rubber tires should be rigidly enforced. A pre-plan utilizing the Incident Command System should be established. The pre-plan should include development of maps, diagrams of the tire pile and surrounding areas, including water supply sources, and resource lists for needed equipment and personnel.

Extinguishment of tire pile fires is facilitated by the separation of unburned product from the fire to lessen the fuel load. Once adequate separation is accomplished, an earthen berm should be built around the burning tire pile for containment. The burning material removed from the pile can be doused with water and submerged or buried to ensure extinguishment.

The direct application of water and/or foams generally does not provide effective extinguishment in tire fires. Rather, **water is best used to keep the unburned tires from igniting**. Class B foam is generally considered ineffective at extinguishing such fires, but can be used to prevent run-off oil from igniting. Class A foams and wetting agents are useful if applied in the ignition and propagation phases of the fire.

The environmental impact of tire fires on the air can often be minimized by letting the fire free burn, consuming most of the fuel. Generally, of greater concern, is the large volume of run-off oil produced by such fires. Run-off oil should be contained and collected to avoid contamination of ground and well water.

A potential for serious injury exists at tire fire incidents. The fire department should assume the role of safety coordinator for all agencies operating on the fire. In tire fires there is a particular need to maintain fire ground security and to protect non fire department personnel, such as heavy equipment operators.

The costs associated with most tire pile fire incidents are generally very high. All legal remedies for obtaining cost reimbursement should be pursued, including funding available from state and federal environmental protection agencies. The federal funding available would depend on the circumstances of the incident and usually cover reimbursement of local public expenditures.

SUMMARY OF KEY ISSUES

Issue	Comments
1. Agency Coordination	Fire departments and other government agencies are often unaware of scrap and shredded tire operations in their jurisdictions until a fire occurs. Multi-agency coordination is needed in pre-planning and emergency response.
2. Fire Prevention Practices	Tire recycling businesses are often deficient in fire prevention practices. The businesses often operate out of converted industrial facilities, lack security, and use abandoned or run-down properties for storage. These properties often have poor access and become junkyards and disposal sites.
3. Code Enforcement	Many scrap tire dumps and recycling operations do not comply with code provisions for tire storage and pile separation. Strict code enforcement is necessary to both help prevent the fires, and to make site operations more manageable when they do occur.
4. Pre-planning	Though necessary for efficient fire operations, pre-plans for tire facilities are rare. Pre-plans should consider methods of minimizing exposure of unburned tires, strategies for extinguishment, the organization of fire operations, and needs for equipment and personnel, including heavy equipment.
5. Excavation Equipment Needs	Recommended equipment for tire fires are excavators, bulldozers, front-end loaders, and dump trucks.
6. Environmental Hazards	Tire fires are hazardous materials incidents. Smoke containing toxic products of combustion often necessitates evacuations, and run-off oil should be contained to minimize environmental damage.
7. Extinguishment Agents	Applied water is not efficient at extinguishing deep-seated tire fires. Class B foams are not effective on tire fires, but may prevent fires in run-off oil. Class A foams and wetting agents appear effective only during the ignition and propagation stages of the fire.
8. Extinguishment Tactics	Large tire pile fires are best extinguished by separating the burning tires with excavation equipment and extinguishing manageable amounts through submergence in water or burial in dirt.
9. Safety of Personnel	These incidents will involve heavy equipment operators, personnel reclaiming run-off oil, and fire personnel. A unified safety operation is needed to monitor the safety of all personnel and to ensure that individuals have the proper personal protective equipment.
10. Lead Agency and Coordination	Although the fire department will probably be the first agency to respond, this type of incident quickly becomes a multi-agency operation. There should be a unified multi-agency incident command structure accommodating all participants.
11. Disposal	Burned tires to be moved from the site must be totally extinguished before transport to land fill or other disposal areas to prevent a fire at another location. Tires should be relocated only to reputable recycling operations, or code compliant storage areas.
12. Costs	Expenses for excavation equipment, repair and maintenance, and supplies will require significant funding. Some reimbursement may be available through hazardous materials cleanup funds. Cost recoupment measures should be aggressively pursued.

SOURCES AND USAGE OF SCRAP AND SHREDDED TIRES

In the United States, 240 million tires are disposed of each year, and 75 percent of these are added to existing stockpiled tire dumps or discarded in landfills. The ever-increasing number of discarded tires poses serious problems, not only in land use, but also in environmental and fire protection.

In years past, tires were commonly buried in landfills, a practice that continues in some states. Tires are not desirable landfill material because tire casings trap air and buried tires often move, interfering with future landfill reclamation. Generally, the diminishing permitted landfill space is needed for more suitable trash.

Scrap-tire stockpiles, whether in tire dumps or in piles intended for recycling, create fire protection challenges for the fire service. Tires burn with a higher per-pound heat output than most coal, and the high heat production of tire rubber makes extinguishment difficult. Tire pile fires yield large amounts of oil that is both flammable and a threat to the environment. Such fires become hazardous materials incidents that may affect entire communities, often requiring neighborhood evacuations, protracted fire operations, and causing contamination of the air, waterways, and water table.

To address the serious problems caused by stockpiling scrap tires, there have been both legislative pressures and technological advancements to promote tire recycling.

Intermodal Surface Transportation Efficiency Act of 1991

With special machinery, tires can be shredded into crumb rubber for use in paving road surfaces. The tire crumb rubber is mixed with asphalt cement binder to make a durable asphalt surface. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) was expected to increase tire recycling by requiring states receiving federal highway funds to use crumb rubber in asphalt paving.

ISTEA has not been fully implemented, however. Without the ISTEA mandate, the expected demand for 68 million scrap tires to be used in road surfacing has not materialized. Because the cost of crumb rubber asphalt is more expensive than asphalt made with natural materials, the market for crumb rubber asphalt has been weak.

Entrepreneurs who anticipated implementation of the ISTEA mandate started collecting tires and intended to invest in tire-shredding machinery. When the legislation languished, many of these entrepreneurs went out of business, leaving large lots filled with scrap tires. Many of these failed enterprises subsequently experienced fires, as the case studies in this report demonstrate.

The limited implementation of ISTEA has created a business and regulatory climate that may promote tire fires through the following sequence of steps:

1. The growing environmental impact from the continual generation of scrap tires creates concern for tire disposal.
2. Increased regulation of landfills, coupled with limited landfill space, causes local government to encourage tire recycling.
3. Encouragement for tire recycling results in fast-track use and occupancy permits and flexible local zoning requirements.
4. Tire recycling firms begin operations often without the knowledge of local fire authorities.
5. Recycling facilities operate without pile separation required by fire codes and often with alarm and fire protection system deficiencies.
6. Because there are limited uses for shredded tire products, the supply of tires quickly overwhelms demand, the recycling plant's land becomes full, tire collection fees fall, and the recycling firm goes out of business, leaving the tire piles in place.
7. The burden for cleanup and disposal of tires falls to the property owners and local government, who begin legal action against the recycler to recover costs.
8. A tire pile fire begins, often of suspicious origin.

The warning signs of future tire pile fires are summarized in Table 1. According to data from the International Association of Fire Chiefs, corroborated with the case studies presented in this report, tire pile fires often occur after fire code enforcement is initiated.

TABLE 1. WARNING INDICATORS FOR FUTURE TIRE PILE FIRES
<ul style="list-style-type: none"> • The tire operation changes from tire recycling to scrap-tire storage. • The operation began as non-code-compliant. • The state tire-fee-disposal program is not invoiced, and therefore not audited to ensure proper tire disposal and ethical operations. • The business owner resists compliance with code and fire safety practices. • Business ownership changes. • The business owner files for bankruptcy. • The property owner and/or government pursues court action against the tire operation.

Advances in Tire Recycling

To address the problems caused by stockpiling scrap tires, tire-recycling technologies have advanced and positive alternatives are available. According to the Scrap Tire Management Council, common uses for tire reuse and recycling include:

Retreads. Tires can be reused by putting new rubber tread on reusable casings. Approximately 38 million passenger cars and truck tires are retreaded.

Breakwaters. Whole scrap tires are used for breakwaters to reduce shoreline erosion by waves. Artificial reefs made of tires can create habitats for fish.

Crash barriers. Highway crash barriers can be constructed from whole tires.

Crumb rubber. Crumb rubber is made by finely shredding tires with the steel cords removed. As noted above, tires shredded into crumb rubber can be used in asphalt paving for road surfaces. Rubber crumb can also be formed into gymnasium floor mats, used to cover playgrounds and athletic fields, mixed with dirt as a playing surface, or used for running tracks.

Insulation and linings. Finely ground scrap-tire rubber can be use for sound insulation pads and truck and trailer cargo-compartment liners.

Fuel. The greatest use of old tires is the recovery of energy and conversion to fuel. Such tire-derived fuel is used in cement kilns, pulp paper mills, and electric utilities. An estimated 85 million scrap tires are used as fuel annually. Emissions and heat output of tire-derived fuel are about the same as from coal.

Barriers to Recycling

Although efforts are under way to increase usage of scrap tires, several scientific and technological problems remain.

Pyrolysis. Tires can be subjected to pyrolysis to yield oil, gas, and carbon black. Pyrolysis is the process of thermally decomposing organic substances into less complex molecules. Pyrolysis of tires is extremely complex and costly. Tire pyrolysis plants are expensive to build, and the high capital investment has limited the use of pyrolysis for tire recycling.

Vulcanization. The rubber used in tire manufacturing is combined with sulfur under heat to thermoset, or cure, the tire into its shape. No technology is currently available to reverse this process and ‘devulcanize’ tire rubber. Because the sulfur cannot be removed, tire rubber cannot be used in processes such as producing plastics where chemical bonding with other polymers is needed. Vulcanization limits the reuse of tire rubber for manufacturing new products.

HAZARDS OF SCRAP AND SHREDDED TIRES

The composition and construction of tires and the operation of recycling facilities carry unique hazards.

Fire and Environmental Hazards

Rubber tires are made of very combustible compounds, including carbon, oil, benzene, toluene, rubber and sulfur. Tires are not easy to ignite because they are designed to absorb the heat generated by the friction of road contact. Once ignition takes place, however, this same ability of tires to absorb heat makes extinguishment difficult. The high carbon content and steel cords serve as a heat sink, absorbing and storing heat within the tire. Although extinguishment cools the tire from open flaming to a smoldering stage, the stored tire heat can re-ignite the tires.

Scrap-tire storage presents environmental health risks. Standing water between tires is a breeding ground for mosquitoes. Tire piles are also an excellent rodent habitat, contributing another risk to public health.

The EPA does not consider scrap tires a hazardous waste. However, once there is a fire, the tire product breaks down into hazardous compounds including gases, heavy metals, and oil. Experience at large tire fires indicates for every million tires consumed by fire, about 55,000 gallons of unburned run-off oil can pollute the environment unless contained. The average passenger car tire is estimated to produce more than two gallons of oil. Tire fire run-off oil is a significant environment pollutant that can get into ground water and contaminate well water. In addition to run-off oil, at least 32 toxic gases are produced by tire fires.

Hazards at Different Stages of Combustion

There are three distinct stages of tire combustion Hazardous Materials-Managing the Incident, (1995) defines these as:

Ignition and Propagation Phase. Tires give off flammable vapors at approximately 1000 °F (538 °C). However, once a flame front has developed and elevated temperatures are

applied to a large area with a constant radiant heat flow, tires can decompose at as low as 410 °F (210 °C). **Once ignited, a tire pile initially burns at a rate of two square feet every five minutes in the windward direction.**

Compression Stage. After the first several minutes of the fire, the top layers of tires will begin to collapse into strips. **During this stage, heat and smoke levels increase dramatically. In large, high tire piles, the piles will start to collapse in on themselves within 30 to 60 minutes.** Compression causes open flaming to slow down as the internal areas of the tire pile receive less air. The pile continues to collapse, building downward pressure, and forms a semi-solid mass of rubber, tire cords, and steel. Equilibrium also starts to occur.

Equilibrium and Pyrolysis Stage. At this point, the fire is a deep-seated internal fire with low open flames on the surface. The fire is in equilibrium when the level of fuel conversion is approximately equal to the amount of heat, fuel, and oxygen available. Internal temperatures are up to 2000 °F (1100 °C). Tire fires in this stage consume the fuel much more slowly and completely. **During this phase, downward pressure starts to push oil and water run-off into the ground, water, and other areas, depending upon the location of the fire.**

The fire spread is influenced by the tire product configuration. Whole tire piles burn down into the middle of the pile. The shape of the tire casings ensures a flow of cool air to provide oxygen from below as heat and gases rise vertically. The steel cords remaining from burned tires provide a covering that serves to break up water streams and produce steam before the water can reach the seat of the fire. Water run-off forms channels, which allow additional water to flow off without being converted to steam or absorbing the middle pile heat. Shredded tires and crumb rubber piles are similar to coal in that the fire spreads over the surface of the pile, forming a ceramic clay-like crust that deflects water and prevents penetration.

Smoldering Stage. When tires burn in the hot, smoldering (stage)—common when water is being applied—vast amounts of smoke, products of combustion, and toxic chemicals are produced. When tire fires are allowed to free burn, fewer products of combustion are produced and most toxic chemicals are consumed.

Source: Noll pg.407

TABLE 2. TIRE PRODUCT COMBUSTION STAGES CHRONOLOGY				
<i>Stages of Tire Combustion</i>	<i>Time</i>	<i>Whole Tire Fire Progress</i>	<i>Shredded Tires</i>	<i>Action</i>
Ignition/Propagation Stage	0 to 5 minutes	Active tire burning of individual tires but has not extended to the entire pile.	Tire shreds are readily ignited and involve the entire pile quickly.	Early extinguishment with water, Class A foam or wetting agents may be possible.
	15 to 30 minutes	Once fire extends to the pile, the flame spread is two square feet every five minutes.	Fire spreads along surface of pile very quickly.	Separate unburned tire/product from the burning pile; down wind direction first.
Compression Stage	30 to 60 minutes	The top layers of the tires will collapse on themselves. The visible flaming is reduced. The fire then is seated deep in the pile.	Burns like coal pile with hot coal bed in center and a clay-like ash crust on top of pile.	Focus efforts on separation; build containment berms and oil run-off collection ponds.
Equilibrium/Pyrolysis and Smoldering Stages	60 minutes and beyond	Fuel consumption and heat production equalizes. Combustion is efficiently producing sufficient heat to consume most combustion products. Downward pressure of the encompassing pile causes the run-off oil flow to increase.	Clay-like ash crust protects burning core from water stream penetration.	Contain fire spread Contain run-off oil Option 1 – using the excavator separate burning debris into manageable piles and extinguish with fog streams. Option 2 – allow tire/product fire to burn until the pile can be buried.

Storage and Recycling Operation Hazards

Tire entrepreneurs often use vacant industrial locations and buildings for their storage and shredding operations. It is enticing for governments to encourage the use of vacant properties because they can then be placed back on tax roles. However, these industrial properties are often not adequately evaluated for fire protection systems. Moreover, scrap-tire piles usually do not comply with NFPA's guidelines.

Tire shredding equipment may itself be a source of ignition if improperly maintained. The machinery is costly because of the wear and tear of cutting tires containing steel wire cords. This equipment requires maintenance and proper lubrication to avoid breakdowns and build-up of grease. This grease can cause a machinery fire, which in turn can spread to the shredded tire product. Sparks and friction of the shredder cutting through the steel cords are another potential source of fire. These machines should be protected by from fire by automatic sprinkler systems.

TIRE FIRE INCIDENT CASE STUDIES

Case Number One Falling Springs Road, Garfield County, Washington, October 1996

Situation before the Fire: This fire involved shredded tire fill used in a civil engineering, application of road construction. Falling Spring Road was built over a steep ravine. Instead of building a costly bridge, engineers decided to fill the ravine with shredded tire chips. They chose the chips rather than natural fill material because ravines filled with dirt and stone are susceptible to rock slides and avalanches that cause roadways to collapse. Previous success filling ravines with shredded tire chips justified this civil engineering technique on Falling Spring Road. Shredded tire chips are lighter than natural fill, making the fill more stable and reducing its tendency to slide out of the ravine and collapse the road.

Although tire fill had been used with some success in shallow- and moderate-depth ravines, the Falling Spring Road ravine was much deeper than others which had been filled with tire chips before.

Extent and Duration of Fire: After a wet winter and only a few months after its placement, the fill began to smolder. Cracks soon appeared in the pavement and the road surface failed. Finally, the flames flared through the road surface cracks and oil began to run off at the bottom of the ravine. The burning material was deep-seated and attempts at surface fire extinguishment were not successful. The only alternative was to excavate the roadway until the seat of the fire was reached, then to extinguish the fire. The extinguishment effort was protracted and

required heavy equipment with a coordinated fire-fighting effort. The original road construction cost was \$1 million; \$3 million was required for fire extinguishment and clean up.

Pre-Fire Planning: This fire was not anticipated and therefore not pre-planned.

Strategy Employed: The initial strategy was to allow the absence of oxygen to cause the smoldering fire to go out, but this did not work. Firefighters then attempted surface extinguishment; this was also unsuccessful. Excavation was the last resort and required full-depth excavation with equipment capable of very deep digging.

Problems Encountered during Fire Operations: When the tire chips were exposed to oxygen in the air during excavation, the fire flared up and engulfed the excavation equipment. These flare-ups necessitated training on and use of personal protective equipment for non-firefighters who were needed to undertake the operation.

The heavy equipment operators were provided breathing apparatus because of the volume of smoke production. The fire produced a light-grade run-off oil similar to 3-in-1 Oil in a white soapy mixture. This run-off had to be contained. As the excavation reached the thermal center, the tire chips became tar-like clumps that were difficult to handle even with heavy

equipment because the clumps adhered to the machinery.

Other Information: The cause of the fire was determined to be a pyrolytic decomposition of rubber material. This pyrolysis was associated with the rusting of steel tire cords, a high build up of heat, but insufficient oxygen to cause flaming. The

wet season contributed to the initial rusting. The pressure resulting from the depth of landfill in the ravine is theorized to have contributed to the pyrolysis.

After this fire, additional review will be undertaken before shredded tires will again be used for deep ravine fill.

Case Number Two

Washington, Pennsylvania, February 28, 1997

Situation before the Fire: This fire involved shredded tires gathered by a recycling operation that had changed ownership several times. The most recent owners went out of business, leaving the property full of shredded tire product. The local government ordered the owners to bring the buildings into compliance with the fire code. The order included repairing the inoperative sprinkler system and central alarm system.

Extent and Duration of Fire: This fire involved 1.7 million tires in the tire shredding building and in four acres of shredded tire piles. The whole tire piles were stacked 50 feet high, with no separation. The fire burned for 14 days, required the evacuation of 500 residents, and closed two schools.

Pre-Fire Planning: This fire was not pre-planned.

Strategy Employed: The fire department initially used class B foam without success. The department then procured excavation equipment, first to separate unburned tires from the burning pile. Burning material was then excavated and submerged in trash containers filled with water for complete

extinguishment. The trash containers filled with burned tires were trucked to the landfill for disposal. State contractors were used to contain and remove run-off oil.

Problems Encountered during Fire Operations: This tire operation was housed in a converted glass factory equipped with a fire sprinkler system and fire protection fire pump. The fire protection systems were disabled, and the electric power company had disconnected the power supply to the fire pump. When the fire department unit arrived they encountered a fire without separation and they had only a limited water supply for extinguishment. The electric power utility was called to connect the electric to the fire pump which improved the water supply. It took approximately 24 hours to get excavation equipment and state contractors on site.

Other Information: This was a juvenile-set arson fire of a vacant but secured property. An environmental cleanup contractor coordinated by the state and funded by the EPA Superfund contained the run-off oil.

Case Number Three

Cearfoss, Maryland, March 13, 1997

Situation before the Fire: In this situation tires were used as planters and filled with topsoil that was sterilized with boiled water to kill unwanted weeds and bacteria. This use of tires was an agricultural experiment that was approved by the state environmental protection agency. The open-flame heater set up to boil the water for soil sterilization was too close to the combustible tires. Windy weather blew the flames toward closely stacked tire piles.

Extent and Duration of Fire: The property owner had been collecting tires for five years. The fire involved 800 tire planters and approximately 4,800 whole tires. It took 100 firefighters from ten volunteer fire companies twelve hours to control the fire.

Pre-Fire Planning: Neither the fire department nor the state fire marshal had been notified that a permit for the operation had been issued by the State Department of

the Environment. Therefore, the fire was not pre-planned.

Strategy Employed: The limited water supply was not considered sufficient for sustained extinguishment. Therefore, class B foam, was used in an attempt to control the fire, but was not effective.

Problems Encountered during Fire Operations: This fire occurred on farmland in a rural area without a fire protection water supply.

Other Information: The tires were stored too close to combustibles and the owner publicly admitted he knew the tires were a hazard, but ignored the risk. The regional state fire marshal was not aware of the code violations until the fire occurred.

Case Number Four

Chautaugua County, New York, April 23, 1995

Situation before the Fire: The most significant concern in this incident was the potential for run-off oil contamination of the aquifer which was located across the road from the fire. The area topography showed that any run-off from the area would travel toward the aquifer. This aquifer was of major importance to the entire county and several municipalities because it provided drinking water. Run-off threatened to pollute the area's water supply.

Extent and Duration of Fire: A scrap-tire pile consisting of five to six million tires caught fire. It covered seven acres, with tires stacked as high as 30 feet. Approximately two million tires caught fire, and flames threatened to spread through the remaining pile. A rural agricultural area surrounded the tires. Approximately 50 residences and a nearby school were evacuated because of smoke. The fire was declared out on May 1, 1995. However, many re-ignitions continued.

Pre-Fire Planning: The Sinclairville Fire Department was prepared with a pre-fire plan. The local officials also had an emergency plan.

Strategy Employed: State and federal officials were called immediately and the EPA monitored the air quality. The State Department of Environmental Conservation constructed drainage ponds and systems for the collection of run-off oil. The oil was pumped into tankers and trucked to an oil recycling plant.

State and local highway crews using excavation equipment made a physical separation between the burning and unburned tires. They built an earthen berm around the burning tires to prevent the fire from spreading.

The fire department's strategy was **not to use water to extinguish the fire**. Instead, the fire was permitted to burn and air samples were monitored. These samples indicated no significant readings a quarter-mile away from the fire. Once the fire

burned to a manageable size extinguishment began without water. The extinguishment efforts relied on smothering the tires with dirt. This tactic did result in numerous re-ignited fires in the following months. However, the re-ignited fires were of smaller magnitude and easily controlled.

Problems Encountered during Fire Operations: Chautaugua County believed that the threat of oil run-off could have a much more severe impact on the environment than the products of combustion of the burning tires. Although some citizens criticized the fire department for letting the fire burn rather than extinguishing it with water, the strategy was easily explained because the pre-plan research had been done.

Other Information: The fire was well controlled, as planned. Legal action by the town and county against the owner is under way for the recovery of expenses.

Case Number Five

Frankfort, Kentucky, August 15, 1995

Situation before the Fire: At this location a limestone quarry mine that had been converted into a tire recycling operation. The mine included a 300-foot single lane cave, which opened up into a large grotto. Several mine shafts opened into the grotto. The grotto was used as a whole-tire receiving area and the shredded product tire was piled in the other shafts. A previous fire damaged the shredding machinery and the shredding operation ended. As a result the property use changed from recycling to storage only. The tires were packed in the open shaft, which concerned authorities,

and the tire salvage company was ordered not to receive any more tires. The entrepreneurs went out of business rather than comply with fire safety practices, leaving the mine full of tires.

Extent and Duration of Fire: There were 100,000 tires in the caves when a second fire occurred. Since it was too dangerous to fight the fire in the caves, firefighters used positive pressure ventilation and heavy excavation machinery, to remove the tires from the caves and extinguish the fire. The

fire required four days of around-the-clock operations to extinguish.

Pre-Fire Planning: After the first fire in the shredder machine, the fire department became aware of the scrap-tire operation. The department required that fire protection systems be installed.

Strategies Employed: The strategy of positive pressure ventilation using a special fan unit was undertaken. The positive pressure ventilation was used to allow excavation equipment (track hoe) to enter the caves and pull out burning tires. Once removed, they were extinguished with hose lines, buried in moist dirt and sand until cool, then hauled away.

Problems Encountered during Fire Operations: The tire piles were not well-separated and there was limited access to the tires stored in the caves. The access problem hindered personnel, because their self-contained air supply units did not have sufficient duration to enable them to enter

the cave, find the fire, and exit before running out of air.

Other Information: A special unit on mutual aid from the Earlander Fire Department provided the positive pressure ventilation. This smoke removal unit is equipped with a 36-inch diameter fan permanently mounted on a one ton truck chassis. The air flow capacity is 80,000 cubic feet per minute and the air was directed using a 36 inch flexible hose. The excavation equipment operators were trained to use self-contained breathing apparatus and were provided full-protective clothing.

In the face of this code requirements stipulated by the fire department, the owners of the tire operation went out of business and abandoned the tires in place. The second fire occurred while legal action was being undertaken and before tires had been removed from the cave.

Case Number Six

District of Columbia, December 8, 1995

Situation before the Fire: An entrepreneur stored old tires in a warehouse with the intent of making a profit transporting them to a tire recycler. When the warehouse lease was lost, the tires were abandoned in the vacant building, which was then subjected to vandalism.

Extent and Duration of Fire: The fire occurred in a vacant two-story warehouse measuring 45 feet by 105 feet that contained hundreds of thousands of scrap tires packed floor to ceiling. The fire took three days of around-the-clock operations before units could leave the scene. The

resources committed were 125 firefighters, 14 engines, seven ladder trucks, two foam units, a rescue squad, a hazmat unit, and an excavator.

Pre-Fire Planning: The fire department was not aware of the tires stored in the building and believed it to be vacant, so tire fire pre-planning was not completed.

Strategy Employed: The fire chief arrived at the scene 30 minutes after the initial alarm and met with incident commanders to review strategy and tactics. They undertook efforts to contain run-off oil.

Firefighters initially attempted water extinguishment. When no fire suppression headway was made with master streams, they used two foam units to apply AFFF class B foam. The foam had no effect and water streams were resumed.

Problems Encountered during Fire Operations: This vacant building filled with tires was in a mixed light industrial, residential area and access to the fire was limited. There were three overhead doors on the first floor. One was inoperable and framed for a three-foot passage door. The second floor had a loading dock access.

The limited building entry made it difficult to apply a sufficient amount of water difficult.

Other Information: The Environmental Protection Agency and the U.S. Coast Guard were notified of the likelihood of contamination in the Anacostia River, and two fireboats monitored the river. Hazardous material petroleum containment booms were placed in front of storm drains to contain and filter heavy deposits from the run-off water. The sewage treatment facility was notified to activate its scrubbers.

Case Number Seven

Gila River Indian Reservation, Arizona, August 1, 1997

Situation Before the Fire: The Maricopa County Government entered into an agreement with a contractor to build a tire recycling plant and to dispose of the county's scrap tires. In 1994 the contractor leased an area of an industrial park on Indian reservation land to shred three million tires and store the rubber chips. When the lease agreement lapsed, the contractor went out of business and abandoned the shredded tire piles.

The county government had a performance bond with the contractor for \$330,000, which was awarded to the county. After legal expenses the county collected \$230,000. The county offered to share this payment with the reservation for tire disposal costs. Gila River Reservation officials refused the offer because the cost of tire removal was estimated at \$1 to \$2 million. Reservation officials believed that the county should be responsible for the entire cost of the shredded tire removal. This controversy was at an impasse in May

1997 and was ongoing at the time of the fire.

Extent And Duration Of Fire: There were 26 shredded tire piles, each 150 feet long, 60 feet wide, and 35 feet high. A chain-link fence surrounded the property. The fire required that 150 people be evacuated from the area. It took seven days to extinguish the fire, with some continuing flare-ups. The cost of the fire was \$2.2 million.

Pre-Fire Planning: This shredded tire pile problem had been long identified, and in May 1997 the site was pre-planned for a potential fire. A tabletop training session to test the plan was scheduled for September 8, 1997, but the fire pre-empted the drill.

Strategy Employed: Pre-planning revealed that water was not sufficient to extinguish the fire, and that heavy equipment would be needed to separate the unburned tire rubber from burning rubber. Once the unburned tire shreds were moved away from the burning piles, an earthen berm was built

around the burning piles. The berm contained the run-off oil.

The fire chief, on behalf of the reservation officials, declared the incident a disaster. The declaration in turn permitted the state to declare a state of emergency, providing state resources and federal recoupment funding. These resources allowed the procurement of heavy equipment necessary to control the incident.

The testing of a commercial wetting agent early in the incident appeared promising because it was able to knock the fire down and control re-ignition. A large quantity of the wetting agent was air shipped, but when applied did not provide complete extinguishment. Use of the wetting agent was discontinued, and the tire piles were buried in dirt with two to three feet of cover on the top. Burial controlled the fire.

Problems Encountered during Fire Operations: The 26 piles were in four rows with six and seven piles to a row. The separation between piles was inadequate to prevent exposure fires to the other piles.

Although there were fire hydrants, the water tower that supplied the hydrants had 300,000 gallons of water and a very slow resupply. On arrival, the fire had extended from one to two of the 26 piles. Efforts to control the fire were progressing, until a windstorm with 60-mile-per-hour winds spread the fire to 17 piles.

Other Information: As the dirt covering settled and the site experienced rain, the piles flared up again and had to be covered with truckloads of dirt. Nine bulldozers, nine front-end loaders, one grade-all, seven dump trucks, and fourteen water tank trucks were used. The EPA is monitoring the site for ground contamination.

The remaining tire piles are still in place and the cleanup issue between the county and the reservation remains. The potential for a second fire exists. The August fire was believed to be intentionally set, and the investigation remained active at the time of this report

These case studies are summarized in Table 3.

TABLE 3. SUMMARY OF CASE STUDIES							
Incident	Date	Material	Location	Pre-planning	Source of ignition	Extinguishment	Duration and Extent
Falling Spring Road, Garfield County, Washington	February 16, 1996	Shredded tire landfill	Landfill in deep ravine	No	Pyrolysis, possibly rusting of steel tire belts	Excavation of burning material	5 months total; dig out started in May. Fire was out last the week of June, 1996
Washington, Pennsylvania	February 28, 1997	1.7 million tires in a tire shredding building and in four acres of shredded tire piles	Abandoned recycling facility	No	Juvenile arson	Class B foam ineffective. Excavation of burning material with submergence	14 days, with evacuation of 500 residents and closing of 2 schools
Cearfoss, Maryland	March 13, 1997	800 tire planters and 4800 whole tires	Farm	No	Open-flame heater	Water and class B foam ineffective.	12 hours
Chautaugua County, New York	April 23, 1995	Scrap-tire pile consisting of 5 to 6 million tires	Scrap tire pile	Yes	Undetermined	Fire was allowed to burn, then smothered with dirt	9 days, with evacuation of 50 residences and one school
Frankfort, Kentucky	August 15, 1995	100,000 tires and shredded tire product	Limestone quarry mine converted to a tire recycling operation	No	Suspicious	Positive pressure ventilation and excavation followed by burial in dirt and sand	4 days
District of Columbia	December 8, 1995	Several hundred thousand tires	Vacant warehouse	No	Undetermined	Water and class B foam ineffective.	3 days
Gila River Reservation, Arizona	August 1, 1997	3 million shredded tires	Industrial park on Indian reservation	Yes, but fire occurred before drill	Suspicious	Class A foam and wetting agent ineffective. Burial in dirt.	7 days

PLANNING FOR TIRE FIRE PREVENTION AND EXTINGUISHMENT

Planning for tire fire prevention and extinguishment involves three major steps:

- Code enforcement, especially regarding tire pile separation;
- Pre-planning the scrap-tire operation as a potentially protracted target hazard; and
- Identification of excavation equipment to minimize fire spread, coordinated with fire suppression.

Fire Prevention Code Enforcement

Tire fires result in difficult challenges for governments and communities. The fires require extended operations that may involve evacuations of entire communities, severe property damage, the closing of schools, and contamination of air and water. Citizens may criticize fire department operations for not extinguishing the fire quickly, and local and state governments for allowing the scrap-tire operation to exist in their community. To minimize negative public relations the fire department public information officer should be proactive in communicating the circumstances of tire piles and of any fires involving these operations. These efforts may include: education about the difficulty of tire fires, safety precautions to avoid breathing the smoke, the planned actions to control the incident, as well as progress updates. The PIO efforts should be aimed at developing support from the community.

Multi-agency coordination. The disruption to community life that tire fires cause is best minimized by ensuring compliance with fire prevention codes. Compliance helps reduce the risk of tire pile fires. Many of the case studies identified difficulties in fire prevention code enforcement typically due to a lack of multi-agency coordination. This was particularly apparent in the Cearfoss and Frankfort incidents.

- **Cearfoss.** The property owner requested and was issued a permit by the Maryland Department of the Environment to keep old tires. The tires he used as planters caught fire because the open-flame heater used to boil water for sterilizing the soil was too close. The property owner said in the *Frederick Post*, “For five years I’ve been building a fire trap.” He blamed the state for issuing him the permit. “I’m a good salesman and I sold the state a very bad idea.” Deputy State Fire Marshal

Cronauer said “the fire could have been prevented or controlled if the NFPA tire storage code² had been applied.”

The fire prevention efforts failed because the State Department of the Environment notified neither the fire marshal’s office nor the local fire department that a tire storage permit had been issued. Until they responded to the fire, the fire department had no idea that 5,000 scrap tires were stored at the farm.

- **Frankfort.** The scrap tire facility was allowed to go into operation in an abandoned mine without notification to the fire department or local government. The fire department became aware of the operation after a fire damaged the shredding machinery. Tires were packed in the open shafts without proper separation. The fire department ordered the tire salvage company not to receive any more tires. While the fire department and city researched the appropriate code and ordinances with which the salvage company would have to comply, a second fire occurred.

As these cases demonstrate, fire prevention efforts will not be effective unless code enforcement agencies are made aware of tire operations during the use and occupancy and building permit processes. Government agencies at all levels must coordinate their efforts so that scrap-tire operations are in compliance with codes when they open for business.

Proper Tire Storage. The recommended guideline for tire-fire prevention is NFPA 231D Standard for Storage of Rubber Tires. Appendix C of that standard specifically addresses storage of scrap tires. The NFPA standard identifies the following requirements for tire pile separation:

- Fire lanes to provide access for effective fire-fighting operations.
- Clearance from buildings and other exposures.
- Should also be in accordance with NFPA 80A “Protection of Building from Exterior Fire Exposures”. This standard is based on tire storage pile height and the width of piles facing exposures. The general guideline is 60-foot-wide separation, or more in windy conditions.
- Construction of an earthen berm 1-1/2 times the height of the tire pile if the recommended separation distance cannot be achieved.

²NFPA Storage of Rubber Tires, 2310

- Maximum pile size not greater than 20 feet in height and 250 feet in length and width.
- Distance of 50 feet maintained between tire piles and grass, weeds, and brush.

Other fire prevention maintenance programs should include:

- Eliminating weeds, grass and combustible materials within the storage area.
- Situating tire storage on a relatively level area and providing for tire run-off oil at each tire pile. Run-off oil should be contained so that it does not spread fire to other separated tire piles.
- Prohibiting heating devices and potential ignition sources such as smoking and devices that produce welding sparks or open flames.

Tire recycling operations like those engaged in whole-tire shredding often have buildings that contain the shredding or tire rubber crumb machines. These buildings should be protected with automatic sprinkler systems, and the water supply should be adequate both to supply the sprinkler system and to provide water for fighting the tire fire piles.

Tire Fire Pre-Planning

Most fire departments routinely pre-plan fires and emergencies. Of the tire fire case studies examined for this report, however, only two were pre-planned. In the Chautaugua incident, the Sinclairville Fire Department had a pre-plan that included state and federal assistance, the use of state and local highway personnel, and oil containment and transport to oil recyclers. A pre-plan was in place at the Gila River Indian Reservation fire, but the fire occurred before training was complete and the pre-plan could be practiced.

Responsibilities of Local Governments. Often the lack of pre-planning is a result of local governments and fire departments being unaware of stockpiled tires. This was the case in Washington, D.C., where what appeared to be a vacant warehouse was found to be packed with used tires. A similar situation occurred in Frankfort, Kentucky, where the fire department became aware of tires stored in a limestone quarry mine only after an initial fire involving shredding machinery.

Fire departments should be vigilant of tire operations in their areas. There also be communication among government agencies so that fire departments become aware of these operations and can develop pre-plans. Scrap-tire operations and facilities should be considered high-risk target hazards because tire fires are hazardous materials incidents and extremely challenging to extinguish. The fire department should start the pre-plan process by recognizing scrap-tire operations as potential hazardous material/fire incidents, not simply as refuse or trash fires. The challenge of tire fires warrants formal planning to minimize the impact on the community and the environment.

In addition to the traditional pre-planning for fire operations, local governments should be prepared to deal with the business owners who go out of business rather than comply with fire and safety codes. To prevent the local government and the property owner from being left with the cost of disposal when owners go bankrupt and abandon tire piles, tire recyclers and tire operations should be required to provide a performance bond with sufficient value to finance tire removal. The Maricopa County, Arizona, government officials did this when they entered into an agreement with a recycler. Unfortunately, the county received the performance bond of \$230,000 after legal expenses, while the estimated cost of tire removal was \$2 million. The performance bond should be enough to finance the tire product removal and legal expenses.

Pre-planning Considerations. Several factors should be taken into account during pre-planning.

- ***Maps and Diagrams.*** There should be area maps showing not only the tire operation and piles but also potential areas and neighborhoods that may require evacuation. The available mapping should include topographical, aerial, water main, sewer, storm drainage, and soil composition diagrams. These maps help forecast run-off flows and potential containment sites. They also help predict whether the soil will hold the run-off, or whether run-off will be absorbed into the ground and possibly pollute water sources.

These maps also assist in planning where total extinguishment (submerging), truck loading, hauling, or tire product burying will be done. The use of water and heavy equipment will require access road management. Mud, deep ruts, and steel wire cords from burned tires can block or damage vehicles. To ensure that vehicles will

have a suitable roadway to come and go from the fire site, stone, dirt, and a bulldozer are often needed to maintain site access.

The pre-plan should include a diagram of the tire pile site showing all buildings and utilities (gas, electric, heating oil, etc.), machinery controls, and fire protection systems.

- **Command Post Organization.** Tire fires may require evacuations, and planners need to identify evacuation sites, such as schools. Because these fire operations may continue for days or weeks, fire crew rehabilitation and rest areas will be needed. A command post of sufficient size to accommodate multiple agencies, including local, state and federal agency representatives, will also be required. The command post will probably be more effective if it is not at the fire site or too close to fire operations. The command post should not be shared with the rehabilitation area because such an arrangement will create distractions, interfere with public information, hinder coordination with news media, and make it harder to manage logistics and supply.
- **Resource Lists.** There should be a list of public and private resources and suppliers developed so that equipment and supplies can be requested without delay. This list should be current and updated frequently. Examples of equipment and resources are shown in Table 4.

TABLE 4. LISTING OF SOURCES OF EQUIPMENT AND PERSONNEL	
Local and state government	Heavy equipment and operators
School system/transportation agency	Buses for personnel transport, evacuation Rehabilitation shelters
Excavation/rigging contractors	Large bulldozers and excavators (track hoes)
Contract suppliers	Fill dirt and gravel Food service Sanitation and portable toilets
Universities and colleges	Staff from ecology and environmental engineering departments

- ***Incident Command System.*** The pre-plan should be established around the Incident Command System (ICS). This type of incident benefits from an integrated multi-agency public and private operation. While the fire department is responsible for coordinating the fire control, it may necessitate reliance on other experts and contractors. Many responsibilities may be delegated, including operating heavy equipment to separate unburned product and move burned tires to be extinguished or buried.

Excavation Equipment for Tire Fires

In pre-planing for a tire fire, arranging for the proper excavation equipment is crucial. Tire piles fires typically meet the requirements for activation of state Environmental Protection Agency (EPA) assistance, and should be classified as a hazardous materials incident. The state EPA will usually provide contractors familiar with hazardous waste clean up, and who have expertise and knowledge of excavation equipment. However, fire department leaders should not depend totally on the state EPA or contractors for providing the correct excavation equipment. By pre-planning the tire fire incident, the necessary and optional equipment can be pre-arranged to ensure it will be available when needed.

Not all excavation equipment is intended for the same purpose. Many towns and cities have heavy equipment in their highway and road departments. Although readily available for fire emergencies, this equipment may not be suitable for tire fires. For example, the backhoes most highway departments possess do not have buckets with a sufficiently long reach. These backhoes also must be immobilized with support jacks, making it impossible to move the unit quickly if the tire pile collapses onto the machine. Moreover, these units are usually open and do not provide enough safety for the operators.

Three types of equipment are usually needed on tire fires. With these specialized machines, the operation can be more efficient and effective.

Excavator. The machine necessary for separating burning tire piles to allow extinguishment is the excavator with tracks. This is sometimes referred to as a track hoe (Figure 1). The excavator is also available with wheels, but track models are more suited to the muddy terrain that will result from a tire-fire incident.

Excavators are rated by weight, the **length of the bucket reach**, and breakout power. Breakout power is the power of the machine to pull the bucket into undisturbed soil. Shorter reach and a heavier boom improve breakout power. However, for tire fires the important factor is the length of bucket reach. Fire departments should look for machines with the longest reach available that can still be transported on a flatbed trailer without disassembly. This is approximately a 23-ton machine with a reach of 30 feet. Larger excavators require disassembly for transport and reassembly on site.

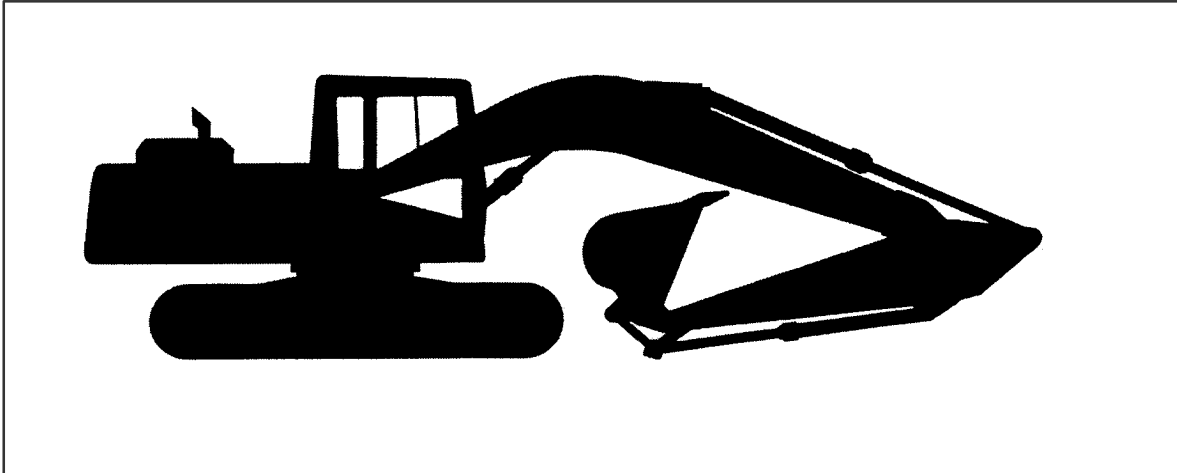


Figure 1. Excavator, or track hoe.

The excavator is a tracked vehicle with a wide stance that is stable without support jacks. It is important that this machinery remain mobile should it need to move out of the way of burning oil flare-ups or pile collapse. The excavator can rotate 360 degrees on a turntable. It has a fully enclosed cab, in which the operator is situated five to six feet above the ground. That position, combined with the long reach, provides the operator with sufficient safety to operate on tire fires. Although the cab of the machine is enclosed, operators should wear hard hats, appropriate protective clothing, and breathing apparatus if necessary. Excavators are usually equipped with a roof escape hatch should the machine overturn or the side door become blocked during tire fire operations. A fire-fighting crew with charged hose lines should always be available for rescue.

The most common attachment to the excavator is the digging bucket, which can be used on tires. Another is the grapple which is hydraulically operated and opens or closes so the tires can be gripped and lifted. While the grapple may work well for whole tires, it is not as effective for tire shreds or burned tire scraps.

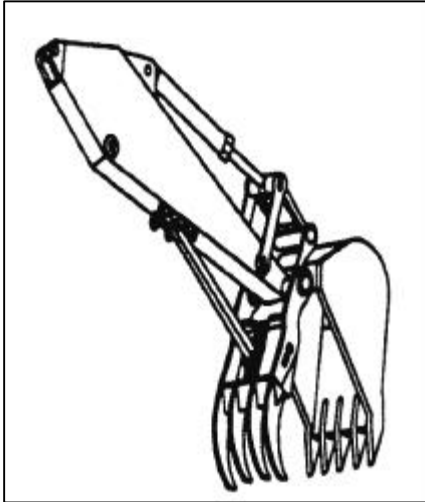


Figure 2. Hydraulic Thumb

The ideal attachment is a bucket used for digging combined with a mechanical thumb attachment (Figure 3). The thumb is a mechanical lever that is hydraulically operated and can close over the bucket as the thumb of the hand closes over cupped fingers. With the mechanical thumb open, the bucket can be used for digging (Figure 2). With the thumb closed over bulky material, it works similarly to a grapple.

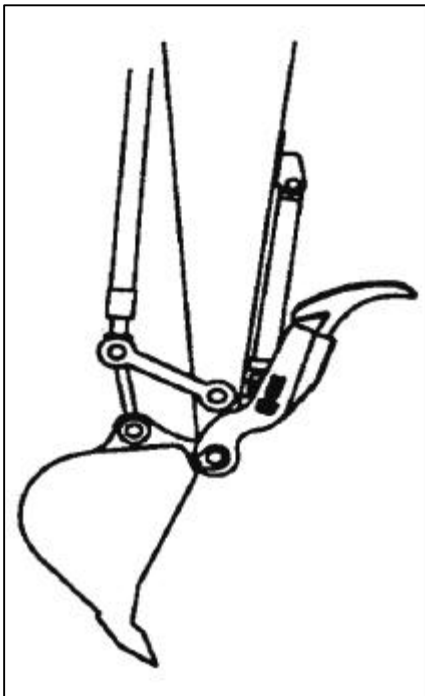


Figure 3. Thumb open for digging

Bulldozers. There is often a need to separate unburned from burning tires to prevent exposure fires and, as in the Chautaugua and Gila River Reservation incidents, to build berms around the burning tires for containment. Bulldozers are used both to push heavy loads of tires and dirt and to build berms. They can be used to dig and grade the run-off oil containment pond as well as to construct access roads or repair roads for heavy equipment. As tires burn, the radial steel wire cords become personnel trip hazards that can also wrap around mechanical equipment drive shafts and damage machinery. A bulldozer can maintain clear passable roadways for other vehicles at these incidents.

The burned tires separated from the pile by the excavator will need to be pushed to the extinguishment area; the bulldozer is the best machine for this task. It can dig the submergence pond in which to soak tires for complete extinguishment.

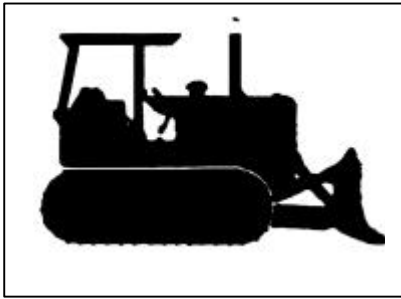


Figure 4. Oval sprocket design



Figure 5. High sprocket design

The key factors in selecting a bulldozer are weight and horsepower. A dozer can not push more than it weighs and has to have sufficient engine horsepower. The bulldozer selected for tire fires should be one of the larger units weighing 30 tons or more with a minimum of 230 horsepower. Dozers are designed specifically to push heavy loads with proportional weight when equipped with aggressive tracks called grouser cleats.

Dozers should not be confused with tracked front-end loaders. The loaders have the weight distributed to provide ballast for the bucket when raised in the air. There is some compromise for front-end loaders that makes them less efficient for pushing heavy weights than are bulldozers.

One manufacturer makes a high-sprocket dozer which is distinguished from oval-track machines (Figure 4) by the triangle-shaped track (Figures 5). The high-sprocket machine offers an advantage for tire fire applications because the hydraulic oil and drive sprocket are higher off the ground, minimizing exposure to flames and entanglement of steel tire cords.

Front End Loaders. The third type of heavy equipment that will be needed is the front-end loader. The loader is a tracked machine that looks similar to a dozer. A loader has a front bucket that can scoop up a load, raise it, and dump the load into a truck or other container (Figure 3). The loader will be needed to load the extinguished tires into trucks for hauling away. The loader can also be used to scoop dirt and dump it on tires to bury them until they cool.

While the front-end loader cannot push as well as a dozer, it could substitute for one if a multi-purpose bucket were used. This bucket has a hydraulically operated bucket extension that converts the open-ended bull push plow for pushing into a bucket closed on the ends for lifting and loading. This multi-purpose bucket allows for pushing and loading.

Efficient use of these machines requires a skilled operator. **It is generally not advisable to attempt to use fire department personnel to operate rented machines.** Even if fire department members are experienced with these specific machines, it is advisable to utilize their experience in safety officer assignments or coordinating with fire operations and the excavation equipment operation.

If trash containers are used, as in the Washington, Pennsylvania, fire, trucks designed to roll back the container on rails and pull the loaded container onto the truck chassis are preferred. Container contractors generally have the trucks to deliver and load these containers. The containers should be drained of water before being loaded on the truck.

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Emergency Response

Major tire fire incidents are likely to involve state and federal environmental agencies to coordinate safe removal of burned tire product. These fires frequently produce a multiple-agency response, including the state EPA for monitoring oil run-off containment and contracting for use of excavation equipment. The federal EPA response center should be notified within 24 hours. Law enforcement is usually needed to help evacuate citizens, control unauthorized entry, and maintain security of evacuated areas. Mutual aid is often necessary for fire services because tire fires are usually protracted, around-the-clock events. Even fire departments with good resources need assistance to be able to respond to regular emergencies in addition to the ongoing tire fire.

Emergency management systems vary slightly, and each fire agency should fully understand its local and state system. Agencies may include:

- Police and EPA enforcement officials
- State and local emergency management departments
- Highway and public works departments
- Regional Federal Emergency Management Agency office
- Regional federal or state EPA office
- State fire marshal's office
- State natural resources agency
- Procurement and finance agency

Procurement of Heavy Equipment. Experience shows that heavy equipment is often needed to supplement fire fighting. Few fire agencies own such equipment, and the equipment itself as well as trained operators is usually procured through contractors. Local and state government highway departments usually have some heavy equipment and trucks that can support the fire department's efforts. Moreover, when tire fires are classified by the state EPA as hazardous materials incidents, state and federal funds may become available to hire excavation contractors.

For example, the Gila River Reservation tire fire was pre-planned and one key element was the state government declaring a state of emergency so that funding, state support, and mutual aid was immediately available. This support allowed the fire department to obtain

water tankers and excavation equipment and to purchase wetting extinguishing agent. In the Garfield County fire, excavation equipment was needed to remove burning shredded tire landfill from a deep ravine.

Fire departments should maintain lists of local and regional contractors that can be used for support when necessary. Examples are:

- Excavation and building supply contractors
- Fire equipment suppliers
- Oil recyclers and hazardous waste contractors
- Food suppliers and portable sanitation contractors
- Apparatus and equipment repair contractors
- Fuel vendors for the on-site vehicles refueling.

Safety Considerations. Precautions must be taken for ensuring safety of residents, including monitoring air quality, and coordinating evacuation if necessary. When residents are moved from their homes, overnight lodging in schools or community relocation facilities may be required. Medical and health-care agencies should be involved to assist the elderly and those with respiratory ailments, which may be aggravated by the smoke of the fire.

There should be coordination with utilities because of the impact on water, sewers, and storm-water drainage. In some cases, power companies have been needed to re-connect electricity at closed tire recycling or storage facilities so that emergency operations could be supported.

Tire fires should be managed like other hazardous material incidents. There should be documentation of all personnel who could be exposed to toxic materials. Safety procedures and operations should be in compliance with the appropriate EPA, OSHA, and applicable state regulations.

FIREFIGHTING STRATEGY AND TACTICS

The objectives for fighting tire and tire product fires should be prioritized in the same way as those for most fires, following time-tested basic steps:

- Rescue/Evacuation
- Exposure Protection
- Confinement
- Extinguishment
- Overhaul

With many fires, the exposure, confinement, and extinguishment phases can occur almost simultaneously with good tactics of hose line placement. With tire fires, however, each phase must be completed before the next is begun. Until the exposure of unburned tires is removed, the fire cannot be contained, and until it is contained, it cannot be extinguished. Extinguishment must be complete before overhaul because of the tendency for tires to retain heat and re-ignite. The strategy and tactics of tire fires will be influenced by the application of fire code, tire pile separation, and pre-planning for resources such as heavy equipment.

Tire fires rarely involve life-threatening rescue challenges, but many require evacuation of residential areas around the site. The speed and direction of the wind will influence the extent of evacuation, and these may change during the days and weeks of fire operations. Evacuation efforts can often be delegated to police or other agencies.

Exposures

All of the tire fire case studies examined involved fire exposure problems, and this may be the most important and difficult challenge to address. The exposure priority of burning tire products is usually the surrounding unburned tire piles. If the fire can be stopped from spreading to unburned piles, then the fire department has protected the exposure and contained the scope of the incident.

Minimizing fire spread to unburned tires is difficult because:

- Most tire piles are not adequately separated.
- Fire apparatus and heavy equipment access roads may be inadequate.
- Tire pile separation requires heavy equipment that may take substantial time to get on site and in operation.
- Even with large amounts of water, it is difficult to keep deep-seated tire fires from re-igniting and spreading from within the pile.
- In the first 30 minutes of the fire, the spread rate can be two square feet every five minutes.

In many of the case studies, fire departments attempted to use water to confine and extinguish the fires with surround-and-drown tactics because the heavy equipment needed to move unburned tires was not immediately available. In the Gila River Reservation incident, only two of 26 piles of tire shreds were on fire when the fire department arrived. A windstorm had spread the fire to 17 piles by the time excavation equipment arrived to move the unburned product exposures.

Therefore, the initial stages of the fire may best be spent planning how to effectively separate unburned tire exposures and how to contain run-off oil. Water is best used to keep unburned tires from burning rather than to extinguish the burning tires.

Containment

Once adequate separation is obtained with excavators and bulldozers, an earthen berm should be built around the burning tire pile. Berms at least one half the height of the tire pile should be sufficient, provided that the angle of repose of the pile is not such that material from the top can tumble out of the confining berm. With the berm complete, the tire fire can be considered contained and extinguishment can become the main focus.

A berm can also be used where adequate separation is not possible; NFPA recommends berms 1-½ times the tire pile height. However, it is difficult to build berms when adequate separation is not available during a fire because heavy equipment and loads of earth must be moved into position.

Extinguishment

There are several strategic considerations and tactical options with tire fire extinguishment. One consideration is the threat to the community and pollution of the environment. Another is whether the tire product is stored inside or out. Depending on the pre-plan and nature of the fire, free burning, submersion or burial may be considered.

Letting the fire burn. The Sinclairville Fire Department used this strategy on the Chautaugua County fire. This was the pre-planned strategy because of concern that extinguishment water would cause ground water contamination and increase the spread of run-off oil. Allowing the fire to burn minimizes the impact on air pollution because the free-burning tire fire is in the equilibrium and pyrolysis phase and will consume most of the fuel. Free burning therefore reduces toxic and carcinogenic combustion emissions such as benzo (a) pyrene and benzene, as well as toluene, chrysene, zinc oxide, titanium dioxide, carbon monoxide, sulfur dioxide, and hydrogen sulfide.

Burying the burning tires. In many cases the most effective means of managing major tire fires will be by smothering the burning material with dirt or fill. Though smothered, the fire will continue to smolder for weeks or months and will usually break out into open flaming periodically. This tactic was used in Chautaugua after the tire pile burned to a manageable size. This was also the primary extinguishment method used by the Gila River Indian Reservation Fire Department. Here, the tire pile was buried under three feet of dirt using bulldozers and heavy equipment. Flare-ups caused by settling and erosion were refilled with dirt.

Use of Water vs. Foam. Most firefighters have success using water on Class A material fires. Class A materials such as wood, paper, and cloth absorb water, and this assists in cooling these burning materials. By contrast, tires and shredded tires do not absorb water, but instead repel it. Much of the water applied by master streams bounces or sprays off the tire ash crust and turns to steam before it reaches the seat of the fire.³ Master streams produce greater run-off without significantly improving fire knock-down. Fog streams may be effective, for dousing separated burning product.

³International Association of Fire Chiefs, Guidelines for the Prevention and Management of Scrap Tire Fires pg. 24

In all the case studies where extinguishment used water successfully, the tactics employed used excavation equipment to first pull the burning material into small manageable piles. The fire was doused with hand-lines and a front-end loader was used to complete overhaul by moving the material to be submerged or buried until cool. In the Washington, Pennsylvania, fire, the burned rubber product was submerged in construction dumpsters filled with water. After the product was sufficiently cooled, the water was drained and the dumpster was trucked to the landfill. In Frankfort, burning tires were removed from caves and doused with hose lines. A loader then buried the tires in dirt until cool and they were trucked away for disposal.

Class B Foams. In some of the case studies, firefighters applied class B foam in a vain attempt to extinguish the fire in the ignition and propagation phase.

In such incidents, fire is spreading rapidly when the fire department arrives. Water is not maintaining extinguishment; the water streams knock down visible flames, but when the streams are directed on another area, the previously knocked-down fire area builds up heat and re-ignites.

This tendency of tire fires to revive with stored heat re-ignition is why many fire departments have used class B foams to attempt to smother the fires by starving them of oxygen. Class B foams are standard supplies on many fire pumpers, which are usually equipped with 10 to 15 gallons of foam concentrate.

In the case studies reviewed, the Washington Pennsylvania, Washington, D.C., Cearfoss, and Frankfort firefighters all used class B foam on the tire product pile, in each case without success. Firefighters at the Gila River Reservation fire used an A, B wetting agent, also without the desired results.

Using class B foams on tires is unsuccessful for three reasons. First, tires are a class A fuel and not extinguished by placing a foam layer between the fuel (tire) and oxygen (air) as is done with flammable liquids. With tire fires, it is not possible to separate the oxygen from the burning tire because the fire will continue to burn under the foam layer.

Second, the tire casing is formed with a built-in void space, which provides pockets of air to feed the fire. Thermal updrafts can also cause burning tire piles to draw air from

within the pile. Whole tire piles create natural vertical and horizontal voids, which act as air vents to the burning material.

Third, foam is not useful on tire fires because run-off oil drains out of the pile below the flame and fire heat level. Run-off oil ignition occurs when the tire pile is disturbed and burning material falls to the lowest level, causing a flare-up.

Although generally ineffective for extinguishing tires, class B foam is important to use on run-off oil to prevent ignition and control any oil run-off fires. A class B foam layer should be maintained over the containment oil pond.

Class A Foams and Wetting Agents. Class A foams are made from a concentrate mixed with water and applied as an air bubble foam. This foam is effective on many class A fires. Class A foams usually include a surfactant which, when the foam breaks down, the liquid is easily absorbed or remains on the surface of the class A materials. This blanket of foam insulates unburned fuel from radiant heat or direct flame impingement.

Wetting agents are chemical compounds which include a surfactant and reduce the surface tension when mixed with water to improve penetration. This serves to improve the effectiveness of water in reducing run-off.

There is controversy over whether class A foams and wetting agents are useful on tire fires. On one hand, experiments with class A foams by members of the Phoenix Fire Department suggest that the class A foams provide a definite advantage, especially in deep-seated fires in wood or tires.⁴ On the other hand, class A agents may have to be used earlier in the course of a fire (within the first 15 to 30 minutes) than is commonly possible with tire fires.

⁴ Stern, Jeff, and Routley, Gordon. *Class A Foam For Structural Firefighting (United States Fire Administration Technical Report Series)*, 1996.

The detergents in class A foams may help extinguish tire fires because the water-detergent mixture stays on the tire long enough to absorb heat. Moreover, the surfactant properties reduce surface tension and keep water from merely bouncing off tires. Many class A materials resist absorption of water because of surface tension. Wetting agents reduce surface tension, permitting water to flow and spread uniformly over solid surfaces. In theory, wetting agents improve adhesion of water to surfaces and increase absorptive speed. This allows the water to remain at the burning surface or to be absorbed into the burning fire seat where it can absorb heat and extinguish the fire. (See Appendix A, Large Scale Test to Evaluate the Effectiveness of Various Fire Suppression Agents on Burning Stacked Tires).

There have been reports of limited success of wetting agents on tire fires. At the Gila River Reservation fire, these agents were tested in small quantities with some initial success. However, when additional quantities were delivered, it was not possible to get total extinguishment of the tire-shred piles.

Wetting agents and class A foams appear to have their best effect if used early in tire product fires. Their successful use seems to depend on delivery when the fire is in the ignition and propagation stages. Thus, the factor limiting the effectiveness of wetting agents and class A foams is having sufficient quantities available to use during the ignition and propagation phase of the fire and to start application then. Unfortunately, early application is often not practical because extinguishment should not begin until unburned tires are separated from burning piles and the pile fire is contained with berms. By the time those tasks are completed, the tire fire has usually reached advanced stages.

When used, class A foams change the capability of the fog nozzle by reducing stream reach, velocity, and spray coarseness. Compressed air systems may overcome the negative effects of class A foams on fog nozzles and improve foam delivery reach.

Overhaul

Water alone does not usually ensure total extinguishment because tire fires become deep-seated and must be dug out. Even when the fire can be knocked down, it is subject to re-ignition because the tires retain heat and decompose at relatively low temperatures.

To ensure extinguishment, the burned tire product should be buried in dirt or submerged until cooled below 200 °F. Burned tires may be submerged in construction dumpsters filled

with water or in a three- to four-foot-deep water pond. Extinguished tire product is submerged in the pond until cool, then loaded into transport trucks with a front-end loader.

Tires must be completely extinguished before they can be transported to another site or landfill. If not extinguished, the tire remains can re-ignite at another location. It is dangerous to have a truckload of burned tire material re-ignite on the highway or to spread fire to a landfill. Regardless of how big the fire is, overhaul must ensure that the fire is totally extinguished before off-site disposal is attempted.

ENVIRONMENTAL HAZARD CONTAINMENT

Preventing tire fire run-off oil from contaminating ground water and well water generally requires support from hazardous waste experts. Large tire product fires produce significant quantities of oil that usually are not consumed by the fire, but instead drain out the bottom of the burning tire pile. This draining run-off oil should be contained in a safe manner so that it does not contaminate the environment or become a secondary Class B fire.

Controlling run-off oil spills should begin with pre-planning the tire fire incident. The tire pile topography is important so that natural drainage can be used to predict oil and water run-off. When constructing containment berms around the burning tire piles, drainage pipes should be placed at the bottom to provide for run-off drainage. All of the run-off should be directed into a drainage pond where the oil can be cooled and separated from the run-off firefighting water.

At one of the largest tire fires in U.S. history, 9 million tires in Winchester, VA burned and produced 500,000 gallons of run-off oil. About 250,000 gallons of oil were recovered. This incident involved building dikes and a containment pond to control run-off. A secondary containment pond was used to hold oil separated from the run-off water. The run-off oil was pumped into tank trucks and recycled. The oil containment pond used on the Winchester fire was lined with rubber membrane material normally used for commercial roofing. This oil containment operation was critical because escaping oil of this volume threatened the Potomac River, the water supply for the cities of Hagerstown, Md., and Washington, D.C.

As containment ponds are built and receive run-off water and oil, firefighters must prevent oil from overflowing the ponds. Water usage should be controlled; firefighters should not continue applying large volumes of water on burning tires if it has no effect. The overuse of water will only increase run-off and cause overflow of containment ponds.

Public information efforts should be prompted and continual throughout the duration of the incident to avoid citizens' criticism over extended operations coupled with a fire department's difficulty in putting the fire out. Ineffective public information can influence fire commanders to needlessly flow large volumes of water to look good for public

relations. This will likely overwhelm the ability to control run-off oil containment and result in a negative impact on the environment. Water is properly used in conjunction with digging out the piles with an excavator and extinguishing smaller piles

In addition to all of the priorities of dealing with the tire fire and the collection of run-off oil, precautions should be taken to ensure that the run-off does not ignite and cause a flammable liquids fire. The containment of the oil pond should include security, such as a chain-link fence, to prevent construction vehicles from mistaking the oil pond for tire overhaul submergence ponds. With a hot oil pond near a raging tire fire, the potential for ignition of a flammable liquid is a real threat. To prevent ignition, the run-off oil pond should be covered with class B foam such as AFFF. The foam layer should be maintained over the ponds with oil on the surface. Most class B foams are designed to mend the foam blanket. This foam layer will prevent and extinguish an ignition of the run-off oil.

SAFETY OF OPERATIONS

As with all fires, potential for serious injury exists at tire fire incidents. With these fires, the safety issue goes beyond just fire department operations because of all the other public and private agencies also participating.

The fire department should assume the role of safety coordination for all the agencies operating on the fire. This is notwithstanding the fact that all contract personnel, as well as those operating under the control of other public agencies, should be monitored by their respective employers. Safety responsibilities should be handled per OSHA regulations, specifically 1910-120, paragraph Q.4, "Hazardous Waste Operations and Emergency Response," and with EPA safety regulations. NFPA 1500 standards also would apply. A designated safety officer should oversee the firefighting, run-off containment, and burned product overhaul and removal. The safety effort should be an around-the-clock operation and will require shifts. Many fire departments have shift coverage. However, to ensure accountability, shifts assigned for this fire may be covered with 12-hour shifts on and 12-hour shifts off. Assistant safety officers may be needed to oversee personnel rehabilitation and to provide documentation of all personnel participating. They also would document injuries and subsequent medical treatments that occur at the incident.

These fires generally require the joint effort of many agencies and their respective personnel. Fire ground security is necessary because day-to-day operations will involve working with personnel who do not know one another. Security and safety may be complicated if curiosity seekers and well-intentioned volunteers attempt to enter the fire ground. Security should start with emphasis on requiring identification of all personnel cleared to work at these fires. Also important is personnel accountability, including accountability for non-fire-department personnel such as heavy equipment operators and environmental waste contractors.

All personnel operating in hazardous areas should have appropriate protective equipment including SCBA, if indicated. Some non-fire personnel may need to have personal protective fire equipment provided. The fire department incident commander should assure that anyone with access to the site, including contractors, is made aware of the applicable safety requirements. Again, the fire department's role here is not an exclusive

one and non-fire personnel are ultimately the responsibility of their employers. At a minimum, the following steps should be taken:

1. **Site briefing** - All personnel entering the scene should be advised of the conditions, inherent dangers, and potential risks. Fire department safety procedures and personnel accountability rules should be covered at the briefing.
2. **Communications** - It should be verified that equipment operators have or are provided communications capabilities that are fully compatible with other fire department communications equipment.
3. **Personal protection** – Personal protective ensemble, including appropriate respiratory equipment, should be ensured for all fire ground personnel. Those not familiar with the use of respiratory equipment may need to be trained in how to wear and use this equipment properly.
4. **Supervision and monitoring** – The fire department should maintain close supervision of contractor personnel during operations, and provide on-going environmental monitoring.

Additional safety concerns include the following:

- The heavy equipment operators are at greatest risk because they will be working nearest to the fire. Those especially at risk include bulldozer operators moving unburned tire product during the propagation phase of rapid-fire spread, and excavator operators who will be subject to fire flare-up when the burning tires are pulled from the pile. A Rapid Intervention Team of fire personnel should always be ready to move in with charged attack lines to protect or rescue heavy equipment operators.
- Heavy equipment should not be driven over burned piles. The center of these piles can be likened to volcano lava, and is very unstable.
- Because tire piles may be stacked very high, there is a threat that they may collapse or fall on heavy equipment and personnel. Operators may become

entrapped, injured, or killed. High stacked tire piles should be moved using tracked excavators with high reach to pull the tires down while bulldozers push the tires away for separation.

- Flare-ups of fire can occur by re-ignition, in run-off oil, and by air reaching the center of the pile when the excavator pulls up burning material. Suppression crews with adequate hose lines must be available to extinguish small piles and keep class B foam on the run-off containment oil.

COST RECOVERY RESOURCES

The Winchester, VA, tire fire of 1983 was one of the largest in the United States. Like most scrap-tire product fires, it was very expensive. During the first week of the fire \$330,000 was spent on operations, with an average cost of \$45,000 per day. The cost to finally contain the fire and control the oil run-off was \$1.2 million.

The fires detailed in this report were similarly expensive. The cost estimate to remove the tire product before the Gila River Reservation fire occurred was \$2 million; the cost of the weeklong fire was \$2.2 million. The Falling Spring Road fire carried fire and cleanup costs of \$3 million.

In most cases local governments alone cannot handle the costs involved in extinguishing tire fires and the ensuing reclamation tasks. These fires will require resources and funding from state and federal government. Most of the funds available are from state environmental protection agencies in conjunction with the federal EPA. The EPA may reimburse local fire departments up to \$25,000 for expenses related to emergency actions required to extinguish and control a tire fire. To access these funds, responders must contact the National Response Center within 24 hours of initiation of the response at 800-424-8802. Also, assistance to support the containment, extinguishment and remediation of large tire fire incidents is available through the EPA as authorized by the Comprehensive Environmental Response and Liability Act of 1980 (CERCLA), as amended by the Superfund and Reauthorization Act (SARA) of 1986 (see Appendix B). Superfund assistance is managed by EPA officials who are deployed to the scene to help coordinate the resources.

At the Gila River Reservation fire, prior planning streamlined the approval and authorization process for assistance. The fire chief, on behalf of Indian reservation officials, made the initial request through the appropriate state and federal government agencies. Local officials may also want to investigate whether state or federal disaster relief monies would be available to offset the costs of response and recovery.

In most of the case studies, the costs went beyond the use of expended supplies. Usually, fire departments operating on tire fires will suffer damage and contamination to equipment, including personal protective gear, hoses, and tools that have to be replaced. It will be important to document all supply accounts with billing records, as well as with replacement equipment invoices. Because not all expenses may be reimbursed, it may be advantageous and necessary to pursue subsequent legal action against responsible parties, if practical.

Fire departments also can access cost recovery of emergency operations through the business and property owners. This process usually involves court-ordered fines and restitution procedures. Property owners also may be held liable through performance bonds and/or state environmental laws if compliance with appropriate regulations was derelict.

At the federal level, legislative initiatives are progressing to help prevent scrap tire fires, and to assist communities that are confronted with a major tire fire. Congressman Kennedy of Rhode Island and Senator Chafee have introduced a bill to the House of Representatives and to the U.S. Senate, respectively, called the “Tire Pile Improvement and Remediation Effectiveness Act”. The Act would amend the Solid Waste Disposal Act to provide states with federal grants for fire lane construction and removal of certain scrap tire piles. The proposed legislation gives priority to tire fires near community water systems, schools, and retirement communities. It also calls for grants to be provided when there are tire piles with one million tires or more (see Appendix C.) This bill was under review by the House Committee on Commerce and was referred to the Subcommittee of Finance and Hazardous Materials.

In the Commonwealth of Pennsylvania, the state legislature passed Act190, signed by the Governor on December 1996, which provides one million dollars a year to remediate waste tire piles across the state. The Act also provides two million dollars in tax credits for three years for companies or individuals which make capital improvements in equipment that processes waste tires (see Appendix D). The first round of grants of one million dollars is expected to clean up 800,000 tires at seven sites. The State Department of Environmental Protection has set aside \$250,000 for construction and renovation of public recreational areas utilizing scrap tires or tire rubber-derived materials.

Congressman McCain of Arizona, introduced legislation in the Senate which requires that USFA report to Congress on the specific risks and associated issues pertaining to scrap tire piles and fires.

These positive efforts are viewed as models necessary to control the scrap tire problems before a fire makes it a Hazmat emergency.

LESSONS LEARNED

1. Strict fire code enforcement is necessary to keep tire product piles of manageable size so that fires can be prevented or quickly controlled.

Fire codes and safety practices for scrap-tire business operations must be aggressively enforced. Scrap-tire recycling, shredding, or storage businesses should not be allowed to start operations without the appropriate use and occupancy permit process. Firms should comply with NFPA's Standard for Storage of Rubber Tires 231 D to ensure the appropriate pile separation. Exceptions should not be made for firms claiming special circumstances, such as occupancy for outside storage or use of only unheated areas or temporary trailer office space. The substantial potential for major fires at such operations warrants treating tire recycle and storage business as a hazardous material facility. These operations tend to have lax security, become ill kept, over stocked, and in disrepair increasing fire hazards dramatically. Routine periodic inspections are necessary to ensure that these operations remain in compliance.

2. Fire departments should pre-fire plan all tire operations in detail and consider them substantial target hazards.

To prepare for fire, tire operations should be pre-planned and tires treated as a hazardous materials risk. The pre-plan should detail the separation of unburned from burning tires and the containment of run-off oil. It is also necessary to pre-plan major strategy decisions, such as whether the fire will first be allowed to burn (to minimize toxic products of combustion) or whether it will be extinguished by pulling the piles apart, then submerging tire products in water or burying them in dirt. The pre-planning should include development of a list of contractors to provide excavation equipment and estimates of how quickly the equipment can be deployed and become operational. Any unusual circumstances and special equipment requirements should be analyzed, and provided for in the plan.

3. Fire authorities need to emphasize multi-government agency cooperation so that state and local agencies are aware of the risks and share information on scrap tire operations.

Local fire departments in conjunction with other state officials should have identified risks and developed intervention and mitigation strategies to provide fire prevention and protection guidance on tire operations. Local governments should establish ordinances and require performance bonding to cover the cost of tire removal if the business goes bankrupt and abandons the tire product piles. Fire departments should always be aware of tire storage or recycling operations in their areas, and design and implement mutual aid agreements to address the risks. Illegal tire dumping or creation of un-regulated tire piles should be stopped and corrected by the authorities having appropriate jurisdiction. These authorities should request support from other agencies, using resources such as community policing.

4. A multi-agency command post should be established on tire fire incidents so that the command-and-control system will be integrated, and authority and assignments can be effectively delegated.

Command post operations ideally should not be on the fire ground, but instead, located away from the operations sector where it can better coordinate and support the incident. The fireground can become overwhelmed with news media and large numbers of citizen spectators, as well as with volunteers wishing to help extinguish these fires. The command post needs to coordinate the gathering of support, supplies, and resources and to oversee the security of the fire ground and evacuation areas.

5. Tire fires are operationally demanding and technically challenging incidents that will involve all aspects of the Incident Command System (ICS). Key functions include:

Staff functions

- Safety, public information, and liaison with private and public agencies will be crucial for coordination of non-fire-department agencies and contractors.

Operational functions

- Rapid Intervention Teams for the protection of excavation equipment operators and other fireground units.
- Extinguishment team to douse the burning tire product extracted from the pile by the excavator and moved by the front-end loader.

- Class B foam team(s) to protect and prevent run-off oil ignitions.
- Emergency medical services on site.
- Hazardous materials team to monitor personnel exposures, physical effects.

Planning functions

- Coordination of tire pile separation
- Containment berm construction
- Extinguishment strategy
- Overhaul and burn product disposal
- Contingencies planning for variables as change of wind and weather, or oil ignition
- Consultation with technical specialists
- Resource research and service and support logistics
- Personnel support for around-the-clock operations
- Mutual aid for other emergency incidents
- Supplies including food, fuel, and rehabilitation supplies
- Replacement equipment

Finance functions

- Timely procurement of contractors and special equipment resources
- Coordination of local, state, and federal government expense reimbursements
- Incident documentation and accounting
- Cost recoupment efforts from owner operators

6. The availability of the appropriate number and type of excavation equipment is absolutely essential for these fires. Excavation equipment must be large enough to do the job effectively and used within the manufacturer's design limits by skilled operators.

The most desirable equipment for tire product fires are large excavators, bulldozers, and front-end loaders. These machines should be tracked units rather than tire units for increased traction in the muddy conditions typical of tire fires operations. Each of these machines has a specific and necessary purpose. The excavator has the long boom and bucket to pull the unburned pile away from the fire, or reach into the burning tire product and pull the burning material out of deep-seated piles so they can be doused. Bulldozers are

needed to push tire product away from the fire to provide exposure separation. The dozer s are also useful in constructing earthen berms and containment ponds. Front-end loaders are needed to move tire product from the excavator to the submergence or burial area and to load transport trucks. The loaders are also used to load and move earth for berms and burying tires.

7. Tire product fires generally will be protracted and the sequence of fire operations is important. The priority of actions should be rescue/evacuation, exposure, confinement, extinguishment, and overhaul. Exposure and confinement should be completed before attempting extinguishment.

- *Rescue/evacuation.* Rescue problems are uncommon, but the toxic smoke plume may warrant evacuation of area residents. Wider evacuation may become necessary if the weather or wind direction changes.
- *Exposures.* Unless the tire fire is small and likely to be extinguished in the incipient, the separation of unburned tires must be accomplished to limit the full load.
- *Containment.* The next priority is to contain the fire to the burning pile(s) and to contain the run-off oil. Proper containment tactics will prevent burning run-off oil to extend the fire. **Attempts to flood the fire with water before containment will cause increased run-off and environmental damage.**
- *Extinguishment.* After the fire and runoff containment has been accomplish the fire may be allowed to burn to a manageable size until the burning material can be excavated, doused, and then submerged or buried for extinguishment.
- *Overhaul.* This operation ensures the fire is completely out. Because of the tendency of tire fires to retain heat and re-ignite, the burned tire product should be cooled below 200 °F. before transport to a landfill or other location.

8. Class B foams should be used for preventing run-off oil fires and extinguishing oil fires. Class A forms may be effective if applied early in the incipient stage of the fire.

Class B foams are effective for flammable liquid fuels like run-off tire oil and should be used in conjunction with tire pile fire operations. Class B foams should generally not be used on burning tires because they are relatively ineffective on deep-seated class A fires.

Class A foams and wetting agents can be used to extinguish burning tires with success when the fire is in the ignition and propagation stages. This opportunity is most likely to occur when there are no exposure piles, the burning pile is contained, and class A foams are readily available. Most large tire product fires are in the compression or equilibrium and pyrolysis stages before fire operations can begin extinguishment. Class A foams and wetting agents are no more successful than water at extinguishing large tire fires in these later stages. However, wetting agents suggest some advantages over water if the pile is pulled apart and doused, prior to exiting.

9. Officials should be alert for the warning signs and profiles of future tire fires and be proactive in working with fire investigation and arson units to prevent major incidents.

The potential warning signs of future tire pile fires are:

- The operation was allowed to begin non-code-compliant.
- The tire operation changes from tire recycling to scrap-tire storage.
- The state tire fee disposal program is not invoiced, therefore is not audited to ensure proper tire disposal and to identify unethical operations.
- The business owner resists compliance with code and fire safety practices.
- The business owner files for bankruptcy.
- The property owner and/or government pursues court action against the tire operation.

When these warning signs are apparent, fire and arson units should help develop and devise preemptive strategies such as increased facility security and visible police patrols.

10. Tire fires are extremely costly and all laws and legal avenues of expense reimbursement should be researched before a fire.

Major tire pile fires will likely require resources and funding from other sources. Most of the funds available are from state environmental protection agencies in conjunction with the federal EPA and FEMA. For incidents of the magnitude that pose a threat to the environment, funding may be available through the Super Fund and Reauthorization Act. These funds must be coordinated through the federal government. Other methods for recouping funds may include researching all state and local laws that allow replacement of equipment and supplies. Such laws may permit the cost of emergency operations to be passed on to property owners through fines and restitution. Because not all expenses may be reimbursed, it may be advantageous and necessary to pursue legal action against responsible parties requiring. Performance bonding is one important precaution that can be taken to reduce local government costs

11. Safety coordination of the overall incident should be the responsibility of the fire department.

While the fire department usually operates under various safety requirements and standards, as well as OSHA and EPA regulations, other agency personnel may have limited experience operating under these requirements. The fire department safety officer should take the lead to ensure that all private and public personnel work in accordance with fire department safety standards. The fire department may need to review safe use procedures for personal protection equipment for excavation equipment operators. Personnel accountability should be stressed.

Bibliography

- Barker, Jeff. "Tribe Fears Fire in Black Hills." *The Arizona Republic*, May 26, 1997
- Brown, Ken. *Garfield Colorado Falling Springs Site Remediation Project Report*. October 23, 1996. <http://www.wsdot.wagov/transaid/tirefir4.htm>
- Caterpillar, Inc. *Caterpillar Performance Handbook Ed. 26*, Peoria, Illinois: Caterpillar, Inc., October 1995.
- Duncan, Samuel. *Evaluation of NDI Compressed Air Foam Systems (CAFS) Applied as a Retrofit*. Warren, Michigan: U.S. Army Tank-Automotive Command Research, Development and Engineering, August 1994. #13606
- International Association of Fire Chiefs and The Scrap Tire Management Council. *Guidelines For Prevention and Management of Scrap Tire Fires*. Washington, DC
- Hasegawz, H.K., and Staggs, K.J. "Large-scale Tests to Evaluate the Effectiveness of Various Fire Suppression Agents on Burning Stacked Tires (Draft Report)." Livermore, California: Lawrence Livermore National Laboratory, October 5, 1990.
- King, Alan P.E. *Shredded Rubber Tire Fills On Fire*. Washington State Department of Transportation, September 1996. www.wsdot.wagov/transaid/fir4.htm
- National Fire Protection Association. *Standard for Storage of Rubber Tires NFPA 231D*. Quincy, Mass: NFPA, 1989
- Noll, Gregory, Hildebrand, Michael, and Yvorra, James. *Hazardous Materials: Managing The Incident*, 2nd. ed Fire Prevention Publications, Stillwater, Oklahoma, 1995
- Scrap Tire Management Council. *Questions and Answers about Scrap Tire Management* Washington, D.C.: Scrap Tire Management Council, 1995

Department of the Army Belvoir Research, Development and Engineering Center. *Report of Class A Foam Tests (Underwriters Laboratories Project 93NK24320)*. February 1994. Northbrook, Illinois Underwriters Laboratories.

Routley, Gordon, and Boston Fire Department. *Compressed Air Foam for Structural Fire Fighting: A Field Test (United States Fire Administration Technical Report Series)*. Boston: United States Fire Administration, 1993.

Roy, Darmstadt, Benallal, Chaala, Schwerdtfeger. "Vacuum Pyrolysis of Used Tires" Universite' Laval, Quebec Canada May 1995.

Scrap Tire Management Council. *Scrap Tire Use/Disposal Study*. Washington, D.C.: Scrap Tire Management Council: February 1995.

Stern, Jeff, and Routley, Gordon. *Class A Foam For Structural Firefighting (United States Fire Administration Technical Report Series)*, 1996.

"Stubborn Fire of Junk Tires Under Control" New York Times, August 3, 1997.
Scrap Tire Management Council, *Technical Briefings of Scrap Tire Utilization Technologies*. Washington, D.C.: Scrap Tire Management Council, 1992.

"Tire fire ends man's garden dream," *Frederick Post* (Frederick, Md.), March 14, 1997.
Wilk, Damion. "On The Job Washington DC". *Firehouse Magazine*, February 1997, 30-33.

APPENDICES

Appendix A	Large-Scale Test to Evaluate the Effectiveness of Various Fire Suppression Agents on Burning Stacked Tires
Appendix B	Reimbursement to Local Governments for Emergency Response to Hazardous Materials Releases
Appendix C.	House of Representatives Bill 104 Tire Pile Improvement and Remediation Effectiveness Act.
Appendix D	Pennsylvania Waste Tire Remediation Act 190

APPENDIX A

Large-Scale Test to Evaluate the Effectiveness of Various Fire Suppression Agent on Burning Stacked Tires

Large-Scale Test to Evaluate the Effectiveness of Various Fire Suppression Agents on Burning Stacked Tires
by H. K. Hasegawz and K.J. Staggs
SUMMARY OF TEST RESULTS
Oxford Energy Tire Fires

<i>Test TFFT#</i>	<i>Product</i>	<i>Concentration (%)</i>	<i>Extinguished? No. of Applications</i>	<i>Weight Loss (lbs.)</i>	<i>Comments</i>
9	Ansulite	3.0	Yes: 1	5.29	Allowed to sit for 15 min. to ensure it was out.
12	Ansulite Test 2	3.0	Yes: 1	5.51	Allowed to sit for 15 min. to ensure it.
5	VoeFoam	6.0	Yes: 2	6.17	5 min. interval before second application.
13	VoeFoam Test 2	0.6	No	5.1	Put out w/sprinklers.
6	Silver	0.3	Yes: 3	5.07	May have been out before the 3rd. application.
14	Silver Test 2	0.6	No	9.04	Fire appeared to be out, but after 4:00 minutes (3rd. application.
11	Pine Tar	6.0	Yes: 3	6.62	Flameheight down to 8" after 1st. application.
3	Pyrocap	6.0	Yes: 3	6.61	Flameheight down to 1" after 1st. application.
1	Firetrol	0.3	Yes: 3	8.16	Flameheight 3" after 1st. application.
15	Firetrol Test 2	0.6	Yes: 3	6.82	Out at end of 3rd. application
2	Phinex +	3.0	Yes: 3	6.4	Flameheight 3" after 1st. application
4	3M AFFF	6.0	No	7.5	1" flames after 3rd. application.
10	Wetting Agent	0.1	No	15.21	1" flames after 3rd. application.
7	Flouropolidol	3.0	No	18.3	Intense 2" flames after 3rd. application.
8	Polyfoam	8.0	No	16.32	3" flames after 3rd. application.

APPENDIX B

**Reimbursement to Local Governments for Emergency Response to
Hazardous Materials Releases**

PART 310—REIMBURSEMENT TO LOCAL GOVERNMENTS FOR EMERGENCY RESPONSE TO HAZARDOUS SUBSTANCE RELEASES

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APPENDIX II TO PART 310—APPLICATION FOR REIMBURSEMENT TO LOCAL GOVERNMENTS FOR EMERGENCY RESPONSE TO HAZARDOUS SUBSTANCE RELEASES UNDER CERCLA SECTION 123

AUTHORITY: 42 U.S.C. 9611(c)(11), 9623.

SOURCE: 58 FR 4827, Jan. 15, 1993, unless otherwise noted.

Subpart A—General

§ 310.05 Purpose, scope, and applicability.

(a) *Purpose.* Through this part, the Environmental Protection Agency (EPA) is establishing the procedures for reimbursing local governments for temporary emergency measures to prevent or mitigate injury to human health or the environment, as authorized under section 123 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). This program is intended to alleviate significant financial burden on local governments for response to releases or threatened releases of hazardous substances or pollutants or contaminants and will not supplant local funds normally provided for response. Reimbursement does not apply to expenditures incurred in the course of providing what are traditionally local services and responsibilities, such as routine fire-fighting.

(b) *Scope.* Applications for reimbursement for temporary emergency measures may be submitted only through the procedures established in this part. Any general purpose unit of local government for a political subdivision may request reimbursement. States are not eligible for this program. Under this part, local governments may apply for reimbursement for temporary emergency measures performed subsequent to October 21, 1987. Reimbursement may be made for temporary emergency measures conducted during either Federal-lead or non-Federal-lead responses.

(c) *Applicability.* Reimbursement to local governments for temporary emergency measures may not exceed \$25,000 per single response, nor may reimbursement supplant local funds normally provided for response. Because CERCLA specifies that no more than 0.1% of the amount appropriated from the Hazardous Substance Superfund (Superfund or the Fund) may be allocated to the reimbursement program for the five fiscal years beginning October 1, 1986, some requests may not ever be reimbursed even though they meet all requirements of this part.

§ 310.10 Abbreviations.

CERCLA—The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (Pub. L. 96-510, 42 U.S.C. 9601-75), as amended by the Superfund Amendments and Reauthorization Act of 1986, also known as Superfund.

EPA or the Agency—Environmental Protection Agency

NCP—National Oil and Hazardous Substances Pollution Contingency Plan also known as the National Contingency Plan.

OMB—Office of Management and Budget.

SARA—The Superfund Amendments and Reauthorization Act of 1986 (Pub. L. 99-499, 42 U.S.C. 9601).

USCG—U.S. Coast Guard.

§ 310.11 Definitions.

For purposes of this part except when otherwise specified:

(a) *Date of completion* means the date when all field work has been completed and all deliverables (e.g., lab results, technical expert reports) have been received by the local government;

(b) *Emergency Planning and Community Right-To-Know Act of 1986* means Title II—Emergency Planning and Community Right-To-Know Act of the Superfund Amendments and Reauthorization Act of 1986 (EPCRA) (Pub. L. 99-499, 42 U.S.C. 960);

(c) *General purpose unit of local government* means the governing body of a county, parish,

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municipality, city, town, township, Federally-recognized Indian tribe or similar governing body;

(d) *Hazardous substance*, as defined by section 101(14) of CERCLA, means:

(1) Any substance designated pursuant to section 311(b)(2)(A) of the Federal Water Pollution Control Act;

(2) Any element, compound, mixture, solution, or substance designated pursuant to section 102 of CERCLA;

(3) Any hazardous waste having the characteristics identified under or listed pursuant to section 3001 of the Solid Waste Disposal Act (but not including any waste the regulation of which under the Solid Waste Disposal Act has been suspended by Act of Congress);

(4) Any toxic pollutant listed under section 307(a) of the Federal Water Pollution Control Act;

(5) Any hazardous air pollutant listed under section 112 of the Clean Air Act; and

(6) Any imminently hazardous chemical substance or mixture with respect to which the Administrator has taken action pursuant to section 7 of the Toxic Substances Control Act.

The term does not include petroleum, including crude oil or any fraction thereof that is not otherwise specifically listed or designated as a hazardous substance under paragraphs (d)(1) through (d)(6) of this section, and the term does not include natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas);

(e) *Local emergency response plan* means the emergency plan prepared by the Local Emergency Planning Committee (LEPC) as required by section 303 of the Emergency Planning and Community Right-To-Know Act of 1986 (SARA Title III) (EPCRA);

(f) *National Contingency Plan* means the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR part 300);

(g) *National Response Center* means the national communications center located in Washington, DC, that receives and relays notice of oil discharge or releases of hazardous substances to appropriate Federal officials;

(h) *Pollutant or contaminant*, as defined by section 104(a)(2) of CERCLA, includes, but is not limited to, any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformations, in such organisms or their offspring. The

term does not include petroleum, including crude oil and any fraction thereof that is not otherwise specifically listed or designated as a hazardous substance under section 101(14) (A) through (F) of CERCLA, not does it include natural gas, liquefied natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas);

(i) *Release*, as defined by section 101(22) of CERCLA, means any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injection, escaping, leaching, dumping, or disposing into the environment, but excludes: any release that results in exposure to persons solely within a workplace, with respect to a claim that such persons may assert against the employer of such persons; emissions from the engine exhaust of a motor vehicle, rolling stock, aircraft, vessel, or pipeline pumping station engine; release of source, by-product or special nuclear material from a nuclear incident, as those terms are defined in the Atomic Energy Act of 1954, if such release is subject to requirements with respect to financial protection established by the Nuclear Regulatory Commission under section 170 of such act, or, for the purpose of section 104 of CERCLA or any other response action, any release of source, by-product, or special nuclear material from any processing site designated under section 122(a)(1) or 302(a) of the Uranium Mill Tailings Radiation Control Act of 1978; and the normal application of fertilizer. For the purposes of this part, release also means threat of release;

(j) *Single response* means all of the concerted activities conducted in response to a single episode, incident or threat causing or contributing to a release or threatened release of hazardous substances of pollutants or contaminants.

§ 310.12 Penalties.

Any person who knowingly gives or causes to be given any false statement or claim as part of any application for reimbursement under section 123 of CERCLA, upon conviction, may be fined or imprisoned subject to the False Statement Act (Pub. L. 97-398, 18 U.S.C. 1001) and the False Claims Act (Pub. L. 99-562, 31 U.S.C. 3729).

Subpart B—Reimbursement

§ 310.20 Eligibility for reimbursement.

(a) Any general purpose unit of local government may request reimbursement for temporary emergency measures if all requirements under § 310.30 are met.

(b) States are not eligible for reimbursement for temporary emergency measures and no State may request reimbursement on its own behalf or on the behalf of political subdivisions within the State.

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§ 310.30 Requirements for requesting reimbursement.

(a) Response must have been initiated on or after October 21, 1987, the effective date of the interim final rule which governed the reimbursement process prior to the effective date of this part.

(b) The local government must inform EPA or the National Response Center (NRC) of the response as soon as possible, but not later than 24 hours after the start of a response, unless EPA or the USCG has been contacted via the NRC or other established response communication channel. EPA Regional offices and NRC telephone numbers are listed in appendix I of this part.

(c) Requests for reimbursement must demonstrate that response actions are consistent with CERCLA, the NCP and, where applicable, the local comprehensive emergency response plan completed under the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA).

(d) Requests for reimbursement must provide assurance that reimbursement for costs incurred for temporary emergency measures does not supplant local funds normally provided for response.

(e) Applicants for reimbursement must first present requests for payment of incurred costs to all known potentially responsible parties (PRPs) and permit at least 60 days for payment or for expression of intent to pay or willingness to negotiate prior to submitting a reimbursement request to the Agency. Local governments also must pursue all other sources of reimbursement (e.g., insurance, reimbursement from the State) before seeking reimbursement from EPA under this part.

(f) After October 17, 1988, the applicant's jurisdiction must be included in the comprehensive emergency response plan completed by the Local Emergency Planning Committee (LEPC) as required by section 303(a) of EPCRA. This requirement does not apply if the State Emergency Response Commission (SERC) has not established an LEPC responsible for the emergency planning district(s) encompassing the applicant's geographic boundaries.

(Approved by the Office of Management and Budget under control number 2050-0077)

§ 310.40 Allowable and unallowable costs.

To be allowable, costs for which reimbursement is sought must be consistent with CERCLA and with Federal cost principles outlined in the OMB Circular A-87, "Cost Principles for State and Local Governments." The local government may also seek assistance from the EPA Regional Office in determining which costs may be allowable. Final determination of the reasonableness of the

costs for which reimbursement is sought will be made by EPA.

(a) *Allowable cost.* In general, allowable costs are those project costs are eligible, reasonable, necessary and allocable to the project. Costs allowable for reimbursement may include, but are not limited to:

(1) "Disposable materials and supplies" acquired, consumed, and expended specifically for the purpose of the response for which reimbursement is being requested (hereafter referred to as "the response");

(2) Compensation for unbudgeted wages of employees for the time and efforts devoted specifically to the response that are not otherwise provided for in the applicant's operating budget (e.g., overtime pay for permanent full-time and other than full-time employees);

(3) Rental or leasing of equipment used specifically for the response (e.g., protective equipment or clothing, scientific and technical equipment) (Note: reimbursement for these costs will not exceed the duration of the response);

(4) Replacement costs for equipment owned by the applicant that is contaminated beyond reuse or repair, if the applicant can demonstrate that the equipment was a total loss and that the loss occurred during the response (e.g., self-contained breathing apparatus irretrievably contaminated during the response);

(5) Decontamination of equipment contaminated during the response;

(6) Special technical services specifically required for the response (e.g., costs associated with the time and efforts of technical experts/specialists not otherwise provided for by the local government);

(7) Other special services specifically required for the response (e.g., utilities);

(8) Laboratory costs for purposes of analyzing samples taken during the response;

(9) Evacuation costs associated with the services, supplies, and equipment procured for a specific evacuation; and

(10) Containerization or packaging cost including transportation and disposal of hazardous wastes.

(b) *Unallowable costs.* Unallowable costs for reimbursement include, but are not limited to:

(1) Purchase or routine maintenance of equipment of a durable nature that is expected to have a period of service of one year or more after being put into use without material impairment of its physical condition, except as provided in paragraphs (a)(4) and (a)(5) of this section;

(2) Materials and supplies not purchased specifically for the response;

(3) Employee fringe benefits;

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(4) Administrative costs for filing reimbursement applications;

(5) Employee out-of-pocket expenses normally provided for in the applicant's operating budget (e.g., meals, fuel);

(6) Legal expenses that may be incurred as a result of response activities, including efforts to recover costs for potentially responsible parties; and

(7) Medical expenses incurred as a result of response activities.

(c) *Detailed cost documentation.* Detailed cost documentation must be provided by the local government and ensure that costs incurred are substantiated and that cost documentation is adequate for an Agency audit. Documentation of response costs must include at a minimum.

(1) Specification of the temporary emergency measures for which reimbursement is requested;

(2) Specification of the local agency incurring the cost;

(3) Detailed breakdown of actual costs, by cost element such as overtime, equipment rental;

(4) Supporting documents such as invoices, sales receipts, rental or leasing agreements; and

(5) Generally accepted accounting practices consistently applied.

(Approved by the Office of Management and Budget under control number 2050-077)

Subpart C—Procedures for Filing and Processing Reimbursement Requests

§ 310.50 Filing procedures.

(a) Only one request for reimbursement will be accepted for each hazardous substance emergency requiring immediate response at the local level. When more than one local agency or government has participated in such a response, those agencies and governments must determine which single entity will submit the request on behalf of them all.

(b) A request for reimbursement must be submitted on EPA form 9310-1, illustrated in appendix II of this part, and must demonstrate that:

(1) Costs for which reimbursement is sought were incurred for temporary emergency measures taken by the local government to protect human health and the environment from releases or threatened releases of hazardous substances, pollutants or contaminants; temporary emergency measures may include security, source control, release containment, neutralization or other treatment methods, contaminated runoff control and similar activities mitigating immediate threats to human health and the environment;

(2) Reasonable effort has been made to recover costs from the responsible party and from any

other available source and that such effort has been unsuccessful; and

(3) Response actions were not inconsistent with CERCLA, the NCP and, if applicable, the local emergency response plan required under Title III of SARA.

(c) Applicants must certify that:

(1) All costs are accurate and were incurred specifically for the response for which reimbursement is being requested;

(2) The local government complied with the requirement to inform EPA or the USCG of the response, as specified in § 310.30(b);

(3) Reimbursement for costs incurred for response activities does not supplant local funds normally provided for response;

(4) The Potentially Responsible Party (PRP) cannot be identified or is unwilling or unable to pay; and

(5) If costs subsequently are recovered from responsible parties or other sources after the local government has received reimbursement from the Superfund, the local government agrees to return to EPA the reimbursement monies for which costs have been recovered.

(d) Reimbursement requests must be received by EPA within one year of the date of completion of the response for which reimbursement is being requested. Late applications must include an explanation of the delay and will be considered on a case-by-case basis.

(e) A request for reimbursement must be signed by the authorized representative who is the highest ranking official of the local government or his or her delegate.

(f) Completed application and supporting data should be mailed to the LGR Project Officer, Emergency Response Division (5202-G), Environmental Protection Agency, 401 M Street SW., Washington, DC 20460.

(Approved by the Office of Management and Budget under control number 2050-0077)

§ 310.60 Verification and reimbursement.

(a) Upon receipt of a reimbursement request, EPA will verify that it complies with all requirements. Where the request is incomplete or has significant defects, EPA will return the request to the applicant with written notification of its deficiencies.

(b) A request returned to the applicant for correction of deficiencies must be resubmitted to EPA within 60 days.

(c) For purposes of this part, a reimbursement request is deemed complete when EPA determines that the request complies fully with all requirements for reimbursement and with all filing procedures. When the request is complete, a notice will

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be provided to the applicant of EPA's receipt and acceptance for evaluation.

(d) If EPA determines that it cannot complete its evaluation of a request because the records, documents and other evidence were not maintained in accordance with generally accepted accounting principles and practices consistently applied, or were for any reason inadequate to demonstrate the reasonableness of the costs claimed, EPA may reject the request or make adjustments, if possible. Further consideration of such amounts will depend on the adequacy of subsequent documentation. Any additional information requested by EPA must be submitted within 60 days unless specifically extended by EPA. The failure of the applicant to provide in a timely manner the requested information without reasonable cause may be cause for denial of the reimbursement request.

(e) When the reimbursement request is completed, EPA will rank the request on the basis of financial burden. Financial burden will be based on the ratio of eligible response costs to the applicant locality's annual per capita income adjusted for population, with larger fractions representing greater burden than smaller fractions. Per capita income and population statistics used to calculate financial burden shall be those published by the U.S. Department of Commerce, Bureau of the Census, in Current Population Reports, Local Population Estimates, Series P-26, "1988 Population and 1987 Per Capita Income Estimates for Counties and Incorporated Places," Vols. 88-S-SC, 88-ENC-SC, 88-NE-SC, 88-W-SC, 88-WNC-SC, March 1990. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies are available from the Bureau of the Census, Office of Public Affairs, Department of Commerce, Constitution Avenue, NE, Washington, DC 20230 (1-202-763-4040). Copies may be inspected at the U.S. Environmental Protection Agency 401 M Street, SW, Washington, DC, or at the Office of the Federal Register, 800 N. Capitol Street NW., 7th Floor, suite 700, Washington, DC. In ranking requests on the basis of financial burden, EPA also will give consideration to other relevant financial information supplied by the applicant. Once the request is ranked, EPA will:

- (1) Reimburse the request or;
- (2) Decline to reimburse the request; or
- (3) Hold the request for reconsideration if funding for the current review period has been exceeded.

(f) Reimbursement will be made:

- (1) Only for costs that are allowable, reasonable and necessary; and
- (2) Only to the extent that the temporary emergency measures conformed to response criteria es-

tablished by CERCLA, the NCP and the local emergency response plan, if applicable.

(g) The EPA reimbursement official will provide the requester with a written final decision. Payment of approved requests will be made according to § 310.80.

(h) Requests that are not reimbursed after initial consideration remain open for reconsideration, at the EPA reimbursement official's discretion, for one year. EPA will notify the requester in writing if the request is held for later review. After that time, an unreimbursed request will no longer be considered and EPA will notify the requester in writing that the request has been denied.

§ 310.70 Records retention.

An applicant receiving a reimbursement from the Superfund is required to maintain all cost documentation and any other records relating to the reimbursement request and to provide EPA with access to such records. If, after ten years from the date of the reimbursement from the Superfund, EPA has not initiated a cost recovery action, the applicant need retain the records no longer. The applicant must provide EPA with a 60 day notice on its intent to destroy the records. This notification will allow EPA the opportunity to take possession of these records before they are destroyed.

§ 310.80 Payment of approved reimbursement requests.

A reimbursement from the Superfund can be paid only when Superfund monies are available. An approved request in excess of Superfund appropriations available to EPA may be paid only when additional money is appropriated. As appropriations in the Superfund become available, reimbursements will be made in the order in which approved requests are ranked, according to relative financial burden.

§ 310.90 Disputes resolution.

The procedures in this section apply to reviews of denial of reimbursement and reviews of amount of reimbursement.

(a) The EPA reimbursement official's decision constitutes final Agency action unless the requester files a request for review by registered mail within 60 calendar days of the date of decision to the address given in § 310.50(f).

(b) The request for review of the EPA reimbursement official's final written decision must be filed with the disputes decision official identified in the final written decision.

(c) The request for review must include:

- (1) A copy of the EPA reimbursement official's final decision;
- (2) A statement of the amount in dispute;
- (3) A description of the issues involved; and

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(4) A concise statement of the requester's objection to the final decision.

(d) After filing for review, the requester:

(1) Is entitled to an informal conference with the EPA disputes decision official;

(2) May be represented by counsel and may submit documentary evidence and briefs for inclusion in a written record; and

(3) Is entitled to a written decision by the disputes decision official within 45 days from receipt of the request.

APPENDIX I TO PART 310—EPA REGIONS AND NRC TELEPHONE LINES

EPA Regional Office	Telephone	States in Region
I—Boston	(617) 223-7265	ME, NH, VT, MA, RI, C
II—New York	(908) 548-8730	NJ, NY, PR, VI
III—Philadelphia	(215) 597-9898	PA, DE, MD, DC, VA, WV
IV—Atlanta	(404) 347-4062	NC, SC, TN, MS, AL, GA, FL, K
V—Chicago	(312) 353-2318	OH, IN, IL, WI, MN, MI
VI—Dallas	(214) 655-2222	AR, LA, TX, OK, NM
VII—Kansas City	(913) 236-3778	IA, MO, KS, NE
VIII—Denver	(303) 293-1788	CO, UT, WY, MT, ND, SD
IX—San Francisco	(415) 744-2000	AZ, CA, NV, AS, HI, GU, TT
X—Seattle	(206) 553-1263	ID, OR, WA, AK
National Response Center:		
1-800-424-6802 (National—toll free)		
202-267-2675 (Washington, DC)		

ATTACHEMENT 1—COST ELEMENT CODES AND COMMENTS

Code	Cost category	Cost element	Comments
PC	Personnel Compensation.	PC1: Overtime—for services in excess of the local agency's standard work day or work week.	Compensation of overtime costs incurred specifically for a response will be considered only if overtime is not otherwise provided for in the applicant's operating budget.
TR	Transportation	PC2: Experts and consultants—for services rendered on a per diem or fee basis or for services of an intermittent, advisory nature. TR1: Passenger vehicle rental—for transportation of persons during evacuation. TR2: Nonpassenger vehicle rental—for transportation of equipment or supplies.	Passenger and nonpassenger vehicle rental costs will be considered for private vehicles not owned or operated by the applicant or other unit of local government.
RC	Utilities	RC1: Utilities—for power, water, electricity and other services exclusive of transportation and communications.	Utility costs will be considered for private utilities not owned or operated by the applicant or other unit of local government.
OS	Other Contractual Services.	OS1: Contracts for technical or scientific analysis—for tasks requiring specialized hazardous substance response expertise. OS2: Decontamination services—for specialized cleaning or decontamination procedures and supplies to restore clothing, equipment or other serviceable gear to normal functioning.	May include such items as specialized laboratory analyses and sampling.
SM	Supplies and Materials.	SM1: Commodities—for protective gear and clothing, cleanup tools and supplies and similar materials purchased specifically for, and expended during, the response.	May include such items as chemical foam to suppress a fire; food purchased specifically for an evacuation; air purifying canisters for breathing apparatus; disposable, protective suits and gloves; and sampling supplies.
EQ	Equipment	EQ1: Replacement—for durable equipment declared a total loss as a result of contamination during the response. EQ2: Rents—for use of equipment owned by others	Equipment replacement costs will be considered if applicant can demonstrate total loss and proper disposal of contaminated equipment. Equipment rental costs will be considered for privately owned equipment not owned or operated by the applicant or other unit of local government.

APPENDIX C

House of Representatives Bill 104 Tire Pile Improvement and Remediation Effectiveness Act.

FILE h1041.ih

HR 1041 IH
105th CONGRESS
1st Session

To amend the Solid Waste Disposal Act to provide grants to States to stabilize and remove large tire piles that are near drinking water sources and sensitive populations.

IN THE HOUSE OF REPRESENTATIVES

March 12, 1997

Mr. KENNEDY of Rhode Island introduced the following bill; which was referred to the Committee on Commerce

A BILL

To amend the Solid Waste Disposal Act to provide grants to States to stabilize and remove large tire piles that are near drinking water sources and sensitive populations.

[Italic->] Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, [*-Italic*]

SECTION 1. SHORT TITLE.

This Act may be cited as the 'Tire Pile Improvement and Remediation Effectiveness Act'.

SEC. 2. FINDINGS.

Congress finds the following:

- (1) The Solid Waste Disposal Act does not provide for the current stabilization and removal of tire piles.
- (2) There are currently 3,000,000,000 scrap tires located in tire piles in the United States, and 250,000,000 tires are added to tire piles each year.
- (3) Tires, once burning, are difficult to extinguish because tires contain oil (providing fuel), and the interstitial spaces between the tires trap air (providing a source of oxygen).
- (4) Tire pile fires can burn at 2,000 degrees Fahrenheit and put a column of black smoke tens of thousands of feet in the air.
- (5) Burning tires may produce oil as a byproduct of combustion, and it is estimated that one tire can produce one quart of light fraction oil, an extremely toxic form of oil containing toxic substances such as benzene, toluene, and xylene, which are listed as hazardous air pollutants under the Clean Air Act.
- (6) At any site where there is a pile of millions of tires, there is a potential for a large amount of oil and other pollutants to be released, presenting a profound threat to public health and the environment. In the past such piles have caught fire, causing extensive damage to property and the environment.
- (7) Tire piles containing more than 5,000,000 tires pose an immediate potential threat to public health and the environment and should be stabilized and removed with all practicable speed.

SEC. 3. STABILIZATION AND REMOVAL OF SCRAP TIRE PILES.

Section 2004 of the Solid Waste Disposal Act (42 U.S.C. 6914) is amended--

- (1) by striking out the heading and designation for both the section and subsection (a) of the section and inserting in lieu thereof the following:

'SEC. 2004. TIRE GRANTS.

- '(a) GRANTS FOR DISCARDED TIRE DISPOSAL- (1)';
- (2) by striking out '(b) AUTHORIZATION- ' and inserting in lieu thereof '(2)'; and
- (3) by adding at the end the following:
 - '(b) GRANTS FOR TIRE PILE STABILIZATION AND REMOVAL-
 - '(1) GRANTS- The Administrator shall make available grants to States for purposes of constructing fire lanes in, and removing, tire piles containing 1,000,000 or more tires.

- ^(2) PRIORITY-
 - ^(A) FIRE LANE CONSTRUCTION IN PILES CONTAINING 5,000,000 OR MORE TIRES- In awarding grants under this subsection, the Administrator shall give first priority to grants for the construction of fire lanes in tire piles that contain 5,000,000 or more tires and that meet the following criteria:
 - ^(i) The tire pile is located within 10 miles of a community water system, as defined by section 1401 of the Public Health Service Act (42 U.S.C. 300f).
 - ^(ii) The tire pile is located near an area or building, such as a senior retirement community or school, populated by persons who are more sensitive to environmental contaminants.
 - ^(iii) The tire pile is on or adjacent to a facility listed on the National Priorities List under this Act.
 - ^(B) FIRE LANE CONSTRUCTION IN PILES CONTAINING BETWEEN 1,000,000 AND 5,000,000 TIRES- In awarding grants under this subsection, the Administrator shall give second priority to grants for the construction of fire lanes in tire piles that contain 1,000,000 or more tires but less than 5,000,000 tires and that meet the criteria listed under subparagraph (A).
- ^(3) COMPLIANCE WITH GUIDELINES- Fire lanes constructed using a grant under this subsection shall be in compliance with the guidelines of the National Fire Prevention Association.
- ^(4) SUPPLEMENT TO EXISTING STATE PROGRAMS- A grant provided under this subsection shall be in addition to, not in lieu of, any State funding provided for tire pile stabilization and removal through a State tire program existing on the date of the enactment of this subsection.
- ^(5) APPLICATION- A grant may not be awarded under this subsection unless an application is submitted to, and approved by, the Administrator. Such an application shall be submitted in such form and manner, and contain such information, as the Administrator by regulation prescribes.
- ^(6) REGULATIONS- The Administrator shall promulgate regulations to administer grants under this subsection.
- ^(7) AUTHORIZATION- There is authorized to be appropriated \$25,000,000 for fiscal year 1998 to provide grants under this subsection.'.

APPENDIX D
Pennsylvania Waste Tire Remediation Act 190

Pennsylvania Act 190 Results in Cleanup of 8 Million Waste Tires

HARRISBURG, Pa., Dec. 16 /PRNewswire/ -- Approximately eight million waste tires, many of which were stored in illegal scrap piles, have been removed since the enactment of legislation signed into law by Gov. Tom Ridge nearly a year ago, Department of Environmental Protection Secretary James M. Seif said.

"The department's efforts over the past year exemplify our leadership role in promoting the use of waste tires and demonstrate our commitment to cleaning up waste tire piles in the Commonwealth," Seif said.

Seif made his remarks before a Joint Legislative Air and Water Pollution Control and Conservation Committee chaired by Rep. David Argall (R-Berks), a prime sponsor of the act. Seif was accompanied by DEP Solid Waste Program Specialist Tom Woy.

Illegal stockpiles of waste tires pose risks for nearby communities from fires and the breeding of mosquitoes and rodents. During the last two years, DEP has responded to four major and eight smaller tire fires.

"Extinguishing these fires involves an enormous amount of fire-fighting equipment and manpower at a great expense to both local communities and the Commonwealth," Seif said. "For example, the major tire fire in Washington County at National Granulated last February cost the department and the local communities more than \$850,000."

Seif commended local firefighters for their efforts in extinguishing such fires and for their input on the prevention and control of waste tire fires.

Act 190, signed by Gov. Ridge on Dec. 19, 1996, provides \$1 million per year to remediate priority waste tire piles across the state. The bill also provided \$2 million in tax credits for three years to companies or individuals who made capital investments in equipment for the processing of waste tires.

Since the passage of the act, DEP's primary focus has been to remediate existing waste tire piles and develop or expand existing markets for scrap tires generated in the Commonwealth, Seif said.

"In the last two years, we remediated 700,000 tires using \$1 million made available last fiscal year," Seif said. "In addition, 7.3 million tires were remediated as a direct result of compliance actions."

Another \$1.7 million appropriated in the current year will be used to assist municipalities in remediating waste tire piles. At least 11 tire piles containing approximately 1.5 million tires are expected to be remediated by the end of the fiscal year.

In addition, DEP is currently negotiating contracts for the first round of Act 190 grants totaling \$1 million for the remediation of approximately 800,000 tires at seven sites.

Seif pointed out that over the past five years, three markets for waste tires have improved across the United States tire-derived fuel, civil engineering applications and products containing recycled rubber.

"Market development continues to be a key component of our strategy to deal with waste tires," Seif said. "We are currently soliciting grant proposals for \$1 million in industrial market development money."

To encourage other uses of waste tires, DEP has set aside \$250,000 for such projects as the construction or renovation of public recreational areas utilizing waste tires and tire-derived materials. The department is also working with the Pennsylvania Fish and Boat Commission to study the use of waste tires in the construction of various fish habitats.

For more information on waste tires, visit DEP's website at <http://www.dep.state.pa.us> (choose Information by Subject/Land Recycling and Waste Management/Waste Tire Recycling).

Following is the list of priority waste tire piles remediated so far this

year.

PRIORITY WASTE TIRES PILES REMEDIATED

SITE NAME	MUNICIPALITY/TWP.	COUNTY
Caokley	Marlborough	Montgomery
Scerbo	Smithfield	Monroe
Bachart	Packer	Carbon
Bruch	Ross	Monroe
McElhatten	Plumcreek	Armstrong
West Penn Tire	W. Kittanning	Armstrong
Max Cohn Junkyard	Athens	Bradford
Kenny Lang Junkyard	Litchfield	Bradford
Bergey Tire	Sellersville	Bucks
Burns Junkyard	Spring	Centre
Keystone Rubber	Decatur	Clearfield
Commstock's Auto Body	Briar Creek	Columbia
Scrap Recycling	Madison	Columbia
Jenny's Tire yard	Shamokin	Northumberland
Paul Thornton	Richmond	Tioga
National Granulating	Washington	Washington
Weimer Farm	Ligonier	Westmoreland
Glenn Holmes Tire Site	East Coventry	Chester
Pepple	Plumcreek	Armstrong
Louis Shetty Used Autos	Pliatt	Lycoming

SOURCE Pennsylvania Department of Environmental Protection

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